# SECTION 4. RISK ASSESSMENT

## 4.3 HAZARD PROFILES

The following section provides the hazard profile (hazard description, location, extent, previous occurrences and losses, probability of future occurrences, and impact of climate change) and vulnerability assessment for the flood hazard in Burlington County.

### 2024 HMP Changes

- Dam failure has been removed from the flood hazard profile and is now its own hazard of concern (Section 4.3.1).
- Coastal flooding, erosion, and sea level rise have been added to the Flood hazard profile.
- New and updated figures from federal and state agencies are incorporated.
- Previous occurrences were updated with events that occurred between 2018 and 2023.

## 4.3.6 Flood

### Hazard Description

A flood is an overflow of water from oceans, rivers, groundwater, or rainfall that submerges areas that are usually dry. This natural phenomenon can be exacerbated by features of the built environment.

Flooding is a natural hazard that can occur during any season. Flooding typically occurs during prolonged rainfalls over several days, intense rainfalls over a short period of time, or when an ice or debris jam causes a river or stream to overflow onto the surrounding area. Flooding can also result from the failure of a water control structure, such as a dam or levee (NWS 2019) (refer to Section 4.3.1 Dam Failure for more information). Flood can be exacerbated by other hazards such as sea level changes and increased precipitation or severe storms. Additional information regarding severe storms is available in Section 4.3.7.

Flooding events are a common occurrence in the County. A variety of flood types, such as riverine, flash flooding, and stormwater and urban, can cause widespread damage, loss of life, injury, and severe water damage to residential and commercial buildings, bridge and road closures, transit service disruptions, and damage to electrical and communication networks.

Flooding is a temporary condition of partial or complete inundation on normally dry land from the following (NWS 2019):

- Riverine overbank flooding
- Flash floods
- Alluvial fan floods
- Local draining or high groundwater levels
- Fluctuating lake levels
- Ice-jams

- Mudflows or debris floods
- Dam- and levee-break floods
- Coastal flooding

For the purpose of this HMP and as deemed appropriate by the Burlington County Steering Committee, the main flood types of concern discussed in this section include riverine, flash, stormwater/urban, coastal, ice jam, erosion, and sea level rise. These types of floods are further discussed below.

### Riverine Flooding

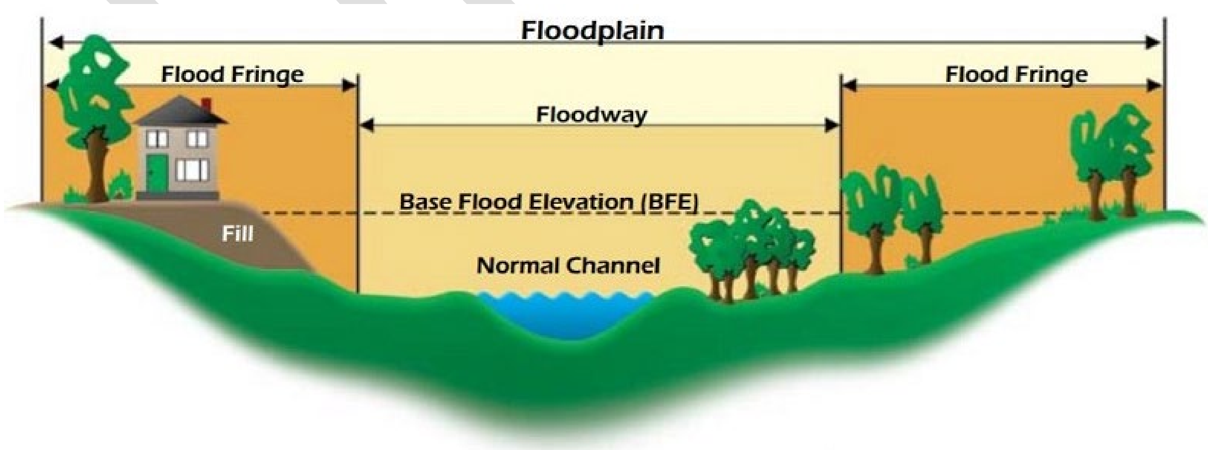
Riverine floods are the most common flood type. They occur along a channel and include overbank and flash flooding. Channels are defined, ground features that carry water through and out of a watershed. They may be called rivers, creeks, streams, or ditches. When a channel receives too much water, the excess water flows over its banks and inundates low-lying areas (FEMA 2019).

#### Floodplains

A floodplain is flat land adjacent to a river, creek, or stream that is subject to periodic inundation (refer to Figure 4.3.6-1). The floodplain describes the area inundated by the "100-year" flood, or a flood that has a 1-percent chance in any given year of being equaled or exceeded. A floodplain is designated when floodwater exceeds the capacity of the main channel, or water escapes the channel through bank erosion. A floodplain is made up of different sections:

- **Flood Fringe:** the area within the floodplain but outside the floodway; this area extends from the outer banks of a floodway to the river valley, where the elevation begins to rise.
- **Floodway:** the channel of a river or other waterway and the adjacent land areas that are under water or reserved to carry and discharge the overflow of water caused by flooding (FEMA 2019, US DHS 2019).

Figure 4.3.6-1. Characteristics of a Floodplain




*Source: FEMA 2022*

In Burlington County, floodplains line the rivers, streams, lakes, and wetlands of the County. The boundaries of the floodplains are altered as a result of changes in land use, the amount of impervious surface, placement of obstructing structures in floodways, changes in precipitation and runoff patterns, improvements in technology for measuring topographic features, and utilization of different hydrologic modeling techniques (USGS 2016).

Floodplain mapping is based on riverine and coastal flooding conditions. Urban and stormwater flooding is not reflected in floodplain mapping. Future flooding conditions (from factors such as sea level rise and changes in rainfall) are not included in FEMA's development of floodplain mapping. As such, floodplain maps may underestimate flood risk in many areas in the region. As a result, the public may also underestimate risk.

Flood hazard areas are identified as Special Flood Hazard Area (SFHA). SFHA are defined as the area that will be inundated by the flood event having a 1-percent chance of being equaled to or exceeded in any given year. The 1-percent annual chance flood is also referred to as the base flood or 100-year flood. A 100-year floodplain is not a flood that will occur once every 100 years; the designation indicates a flood that has a 1-percent chance of being equaled or exceeded each year. Thus, the 100-year flood could occur more than once in a relatively short period of time. Similarly, the moderate flood hazard area (500-year floodplain) will not occur every 500 years but is an event with a 0.2-percent chance of being equaled or exceeded each year (FEMA 2020). The 1-percent annual chance floodplain establishes the area that has flood insurance and floodplain management requirements (FEMA 2020). Additional definitions relating to flood maps can be seen in Figure 4.3.6-2.

It should be noted that areas located outside of the SFHA can be subject to flooding and may even act as an unofficial floodplain. Flooding outside of the SFHA area may include stormwater/urban flooding and flash flooding.

**Figure 4.3.6-2. Flood Map Terms**

**Flood Map Terms**

- Flood hazard areas identified on the Flood Insurance Rate Map are identified as a Special Flood Hazard Area (SFHA).
- SFHA = the area that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year.
- 1-percent annual chance flood = the base flood or 100-year flood.
- SFHAs are labeled as Zone A, Zone AO, Zone AH, Zones A1-A30, Zone AE, Zone A99, Zone AR, Zone AR/AE, Zone AR/AO, Zone AR/A1-A30, Zone AR/A, Zone V, Zone VE, and Zones V1-V30.
- Zone B or Zone X (shaded) = Moderate flood hazard areas and are the areas between the limits of the base flood and the 0.2-percent-annual-chance (or 500-year) flood.
- Zone C or Zone X (unshaded) = Areas of minimal flood hazard, which are the areas outside the SFHA and higher than the elevation of the 0.2-percent-annual-chance flood, are labeled.

*Source: FEMA 2020*

Locations of flood zones in Burlington County as depicted on the FEMA preliminary Digital Flood Insurance Rate Map (DFIRM) are illustrated in Figure 4.3.6-3 and the total land area in the floodplain, exclusive of waterbodies, is summarized in Table 4.3.6-1. Refer to Section 9 for a map of each jurisdiction depicting the floodplains. Flood hazard zones occur throughout the County.

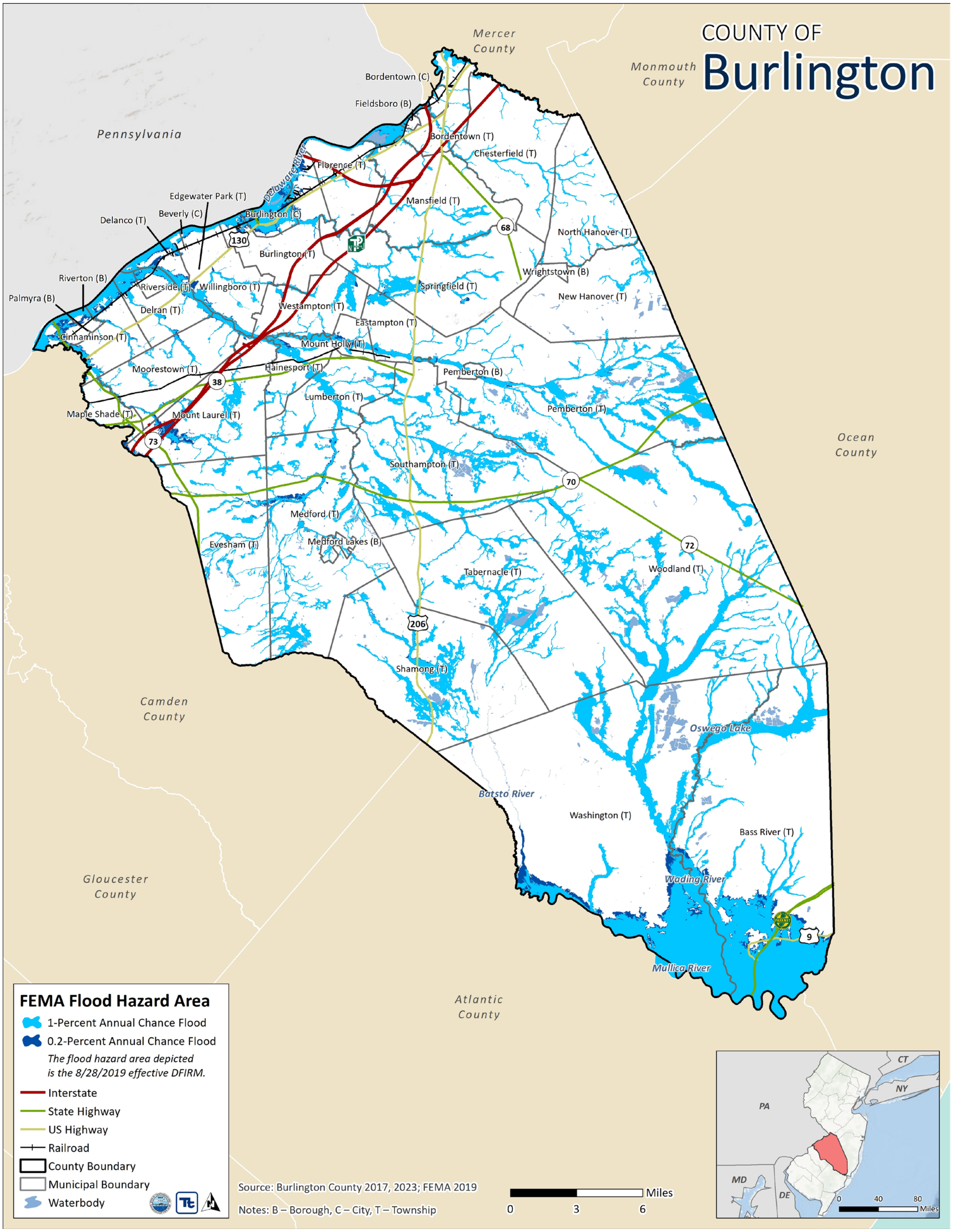
### Table 4.3.6-1. Number of Acres in Burlington County Exposed to 1-Percent and 0.2-Percent Annual Chance Flood

| Jurisdiction | Total Acres of Land Area | Total Acres of Land Area (Excluding Waterbodies) Located in the Flood Hazard Areas | | | |
|---|---|---|---|---|---|
| | | Total Acres Located in the 1-Percent Annual Chance Flood Event | Percent of Total | Total Acres Located in the 0.2-Percent Annual Chance Flood Event | Percent of Total |
| **Bass River (T)** | 45,870 | 11,125 | 24.3% | 12,206 | 26.6% |
| **Beverly (C)** | 347 | 47 | 13.5% | 69 | 19.9% |
| **Bordentown (C)** | 599 | 88 | 14.6% | 94 | 15.6% |
| **Bordentown (T)** | 4,847 | 659 | 13.6% | 697 | 14.4% |
| **Burlington (C)** | 1,618 | 1,107 | 68.4% | 1,338 | 82.7% |
| **Burlington (T)** | 8,580 | 533 | 6.2% | 918 | 10.7% |
| **Chesterfield (T)** | 13,867 | 864 | 6.2% | 881 | 6.4% |
| **Cinnaminson (T)** | 4,786 | 686 | 14.3% | 893 | 18.7% |
| **Delanco (T)** | 1,499 | 315 | 21.0% | 539 | 36.0% |
| **Delran (T)** | 4,239 | 530 | 12.5% | 645 | 15.2% |
| **Eastampton (T)** | 3,696 | 512 | 13.9% | 554 | 15.0% |
| **Edgewater Park (T)** | 1,860 | 5 | 0.3% | 12 | 0.7% |
| **Evesham (T)** | 18,642 | 1,713 | 9.2% | 1,841 | 9.9% |
| **Fieldsboro (B)** | 202 | 30 | 15.0% | 34 | 16.9% |
| **Florence (T)** | 6,235 | 323 | 5.2% | 363 | 5.8% |
| **Hainesport (T)** | 4,202 | 955 | 22.7% | 1,049 | 25.0% |
| **Lumberton (T)** | 8,186 | 1,305 | 15.9% | 1,343 | 16.4% |
| **Mansfield (T)** | 13,924 | 1,292 | 9.3% | 1,298 | 9.3% |
| **Maple Shade (T)** | 2,442 | 184 | 7.5% | 259 | 10.6% |
| **Medford (T)** | 24,676 | 3,145 | 12.7% | 3,506 | 14.2% |
| **Medford Lakes (B)** | 715 | 66 | 9.2% | 69 | 9.7% |
| **Moorestown (T)** | 9,405 | 817 | 8.7% | 954 | 10.1% |
| **Mount Holly (T)** | 1,744 | 226 | 13.0% | 329 | 18.9% |
| **Mount Laurel (T)** | 13,919 | 1,575 | 11.3% | 2,052 | 14.7% |
| **New Hanover (T)** | 14,011 | 499 | 3.6% | 499 | 3.6% |
| **North Hanover (T)** | 10,858 | 784 | 7.2% | 785 | 7.2% |
| **Palmyra (B)** | 1,196 | 307 | 25.6% | 549 | 45.9% |
| **Pemberton (B)** | 382 | 70 | 18.3% | 79 | 20.8% |
| **Pemberton (T)** | 37,863 | 5,958 | 15.7% | 6,084 | 16.1% |
| **Riverside (T)** | 940 | 254 | 27.0% | 308 | 32.8% |
| **Riverton (B)** | 427 | 54 | 12.7% | 122 | 28.5% |
| **Shamong (T)** | 28,011 | 3,783 | 13.5% | 3,864 | 13.8% |

| Jurisdiction | Total Acres of Land Area | Total Acres of Land Area (Excluding Waterbodies) Located in the Flood Hazard Areas | | | |
|---|---|---|---|---|---|
| | | Total Acres Located in the 1-Percent Annual Chance Flood Event | Percent of Total | Total Acres Located in the 0.2-Percent Annual Chance Flood Event | Percent of Total |
| **Southampton (T)** | 27,233 | 4,930 | 18.1% | 5,017 | 18.4% |
| **Springfield (T)** | 18,706 | 2,266 | 12.1% | 2,382 | 12.7% |
| **Tabernacle (T)** | 30,367 | 3,043 | 10.0% | 3,054 | 10.1% |
| **Washington (T)** | 62,351 | 13,085 | 21.0% | 14,465 | 23.2% |
| **Westampton (T)** | 7,037 | 986 | 14.0% | 1,044 | 14.8% |
| **Willingboro (T)** | 4,898 | 468 | 9.6% | 578 | 11.8% |
| **Woodland (T)** | 58,775 | 8,310 | 14.1% | 8,362 | 14.2% |
| **Wrightstown (B)** | 1,328 | 5 | 0.4% | 5 | 0.4% |
| **Burlington County (Total)** | **500,481** | **72,903** | **14.6%** | **79,141** | **15.8%** |

*Source: Burlington County 2023; FEMA 2019*

## Figure 4.3.6-3. FEMA Flood Hazard Areas in Burlington County



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### Flash Flooding

Flash floods are defined by the National Weather Service as "a flood caused by heavy or excessive rainfall in a short period of time, generally less than 6 hours. Flash floods are usually characterized by raging torrents after heavy rains that rip through riverbeds, urban streets, or mountain canyons sweeping everything before them. They can occur within minutes or a few hours of excessive rainfall. They can also occur even if no rain has fallen, for instance after a levee or dam has failed, or after a sudden release of water by a debris or ice jam." (NWS 2009).

### Stormwater/Urban Flooding

Stormwater/urban flooding described below is due to local drainage issues and high groundwater levels. Locally, heavy precipitation may produce flooding in areas other than delineated floodplains or along recognizable channels. If local conditions cannot accommodate intense precipitation through a combination of infiltration and surface runoff, water may accumulate and cause flooding problems. During winter and spring, frozen ground and snow accumulations may contribute to inadequate drainage and localized ponding. Flooding issues of this nature generally occur in areas with flat gradients and generally increase with urbanization which speeds the accumulation of floodwaters because of impervious areas. Shallow street flooding can occur unless channels have been improved to account for increased flows (FEMA 2007).

High groundwater levels can be a concern and cause problems even where there is no surface flooding. Basements are susceptible to high groundwater levels. Seasonally high groundwater is common in many areas, while elsewhere high groundwater occurs only after a long period of above-average precipitation (USGS 2016).

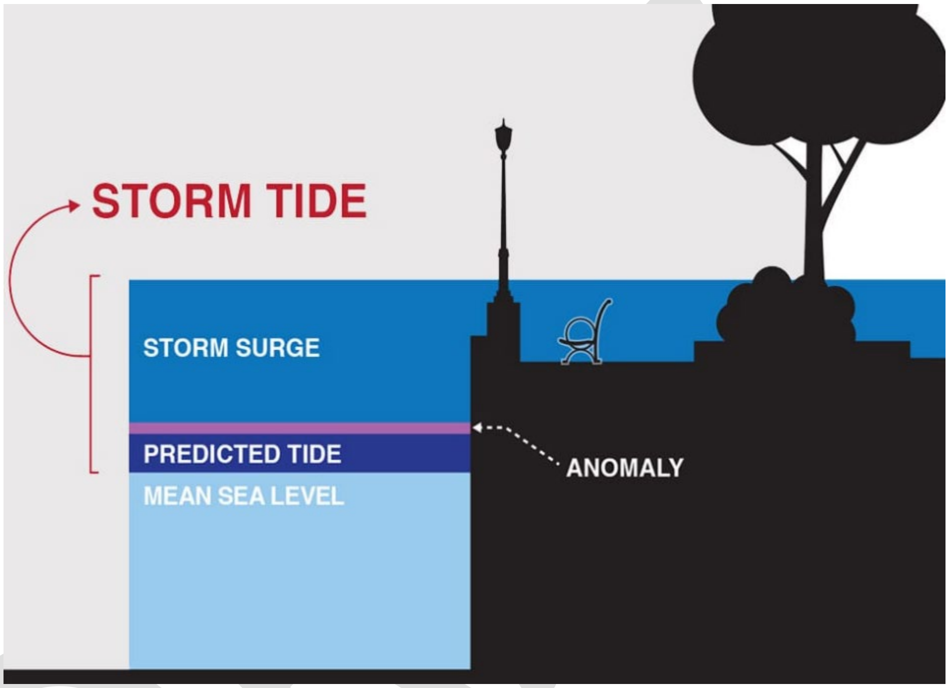
Heavy rainfall that overwhelms a developed area's stormwater infrastructure causing flooding is commonly referred to as urban flooding. Urban flooding can be worsened by aging and inadequate infrastructure and over development of land. The growing number of extreme rainfall events that produce intense precipitation are resulting in increased urban flooding (Center for Disaster Resilience 2016). While coastal, riverine, and lakeshore flooding is mapped and studied by FEMA, urban flooding is not.

NOAA defines urban flooding as the flooding of streets, underpasses, low lying areas, or storm drains (NWS 2009). Urban drainage flooding is caused by increased water runoff due to urban development and inadequate drainage systems. Drainage systems are designed to remove surface water from developed areas as quickly as possible to prevent localized flooding on streets and other urban areas. The systems make use of a closed conveyance system that channels water away from an urban area to surrounding streams. This bypasses the natural processes of water filtration through the ground, containment, and evaporation of excess water. Because drainage systems reduce the amount of time the surface water takes to reach surrounding streams, flooding in those streams can occur more quickly and reach greater depths than prior to development in that area (Harris 2008).

## Coastal Flooding

Coastal areas can experience various kinds of flooding. Other types include moderate and major floods that can be caused by heavy rains (rain with a high rate of accumulation per unit of time), storm surges (water pushed on land by strong winds), and wave action (the movement of waves) that occur during coastal storms (CDC 2017) (NOAA 2023) (US EPA 2023). The combination of these events can result in the total perceived coastal flooding event.

Figure 4.3.6-4. Storm Tide Diagram

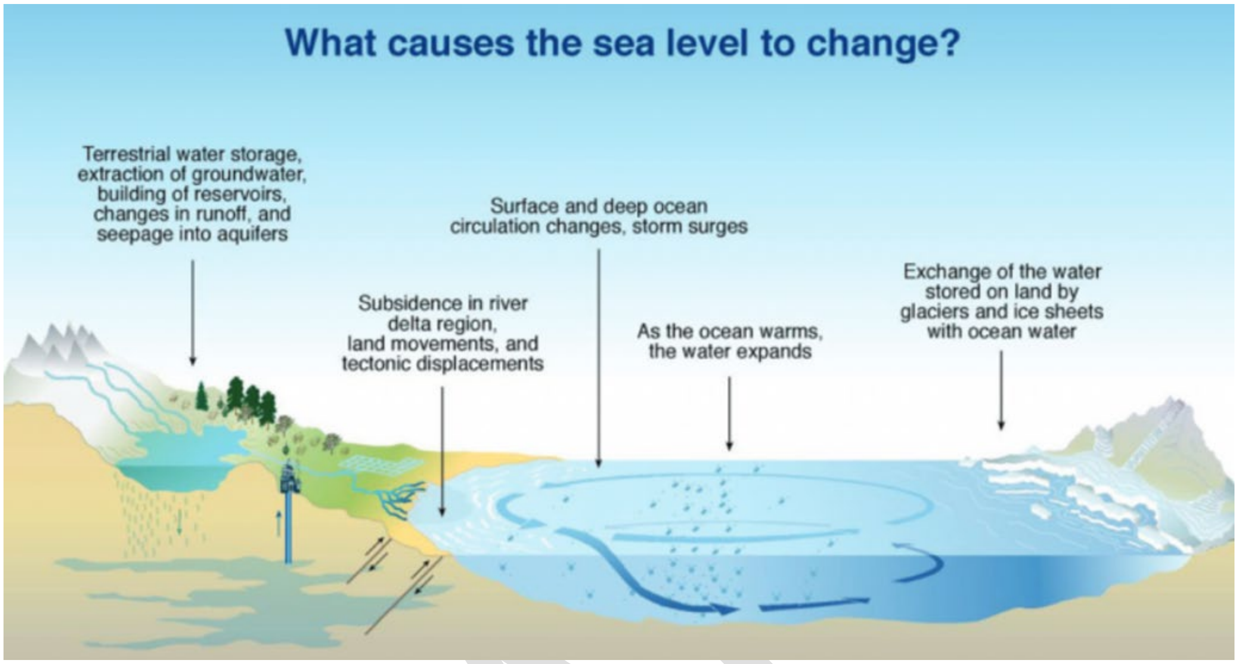



*Source: NOAA 2023*

## Sea Level Rise

There are two types of sea level rise: global and relative (local). Global sea level rise refers to the increase currently observed in the average global sea level trend. This is primarily attributed to changes in ocean volume due to land ice melt and thermal expansion. The melting of glaciers and continental ice masses can contribute significant amounts of freshwater input to the earth's oceans. In addition, increases in global ocean temperature causes an expansion of seawater, increasing ocean volume (NASA 2020). Refer to Figure 4.3.6-5 for an illustration of what causes sea level to change.

Figure 4.3.6-5. Causes of Sea Level Change




*Source: NASA 2020*

Relative or local sea level is affected by global sea level fluctuations, changes in land elevation, winds, and ocean circulation. It refers to the height of the water as measured along the coast relative to a specific point on land. Tide stations measure local sea level rise. Water measurements at the tide stations are referenced to stable vertical points on the land, and a known relationship is established. Measurements at any given tide station include both local sea level rise and vertical land motion (subsidence, glacial rebound, or large-scale tectonic motion). Since the heights of both the land and water change, the land-water interface can vary spatially and temporally and must be defined over time. Depending on the rates of vertical land motion relative to changes in sea level, observed local sea level trends may differ greatly from the average rate of global sea level rise and vary widely from one location to the next (NOAA 2022).

### Erosion

Erosion is the geological process in which earthen materials are worn away and transported by natural forces such as wind or water. Most erosion is performed by liquid water, wind, or ice. Liquid water is the major agent of erosion on Earth. Rain, rivers, floods, lakes, and the ocean carry away bits of soil and sand and slowly wash away the sediment (National Geographic 2023).

### Ice Jam Flooding

An ice jam occurs when pieces of floating ice are carried with a stream's current and accumulate behind any obstruction to the stream flow. Obstructions may include river bends, mouths of tributaries, points where the river slope decreases, as well as dams and bridges. The water held back by this obstruction can cause flooding upstream, and if the obstruction suddenly breaks, flash flooding can occur as well (NESEC 2021). The formation of ice jams depends on the weather and physical condition of the river and stream channels. They are most likely to occur where the channel slope naturally decreases, in culverts, and along shallows where channels may freeze solid. Ice jams and resulting floods can occur during at different times of the year: fall freeze-up from the formation of frazil ice; mid-winter periods when stream channels freeze solid, forming anchor ice; and spring breakup when rising water levels from snowmelt or rainfall break existing ice cover into pieces that accumulate at bridges or other types of obstructions (FEMA 2018).

> Ice Jams At a Glance
>
> - Freeze-up jams occur when floating ice may slow or stop due to a change in water slope as it reaches an obstruction to movement.
> - Breakup jams occur during periods of thaw, generally in late winter and early spring.
>
> *Source: FEMA 2018*

## Location

Flooding potential is influenced by climatology, meteorology, and topography (elevations, latitude, and water bodies and waterways). Flooding potential for each type of flooding that affects Burlington County is described in the subsections below.

### Riverine Flooding

Most flooding in Burlington County occurs during the summer and early fall months; however, floods have occurred at different times throughout the year. According to the County's Flood Insurance Study (FIS) report, multiple waterways have a history of flooding including the Assiscunk Creek, Bass River, Beaverdam Creek, Delaware River, East Branch, Jacks Run, Laurel Run, Masons Creek, Medford Lakes, Mullica River, Pennsauken Creek and its branches, Pompeston Creek, Rancocas Creek and its branches, Swede Run, and Wading River. Many of the bodies of water are the primary source for flooding; however, most flooding is due to indirect causes such as undersized culverts, tidal impacts from headwaters, and confluences with other waterbodies (FEMA 2019).

#### Flood Gages

The USGS National Water Information System (NWIS) collects surface water data from more than 850,000 stations across the country. The time-series data describes stream levels, streamflow (discharge), reservoir and lake levels, surface water quality, and rainfall. The data is collected by automatic recorders and manual field measurements at the gage locations. USGS uses stream gages to determine the severity of flood at different points along a body of water. There are numerous gages in Burlington County, in addition to others just outside of the County's boundary, that provide critical flood data for waterways affecting the County.

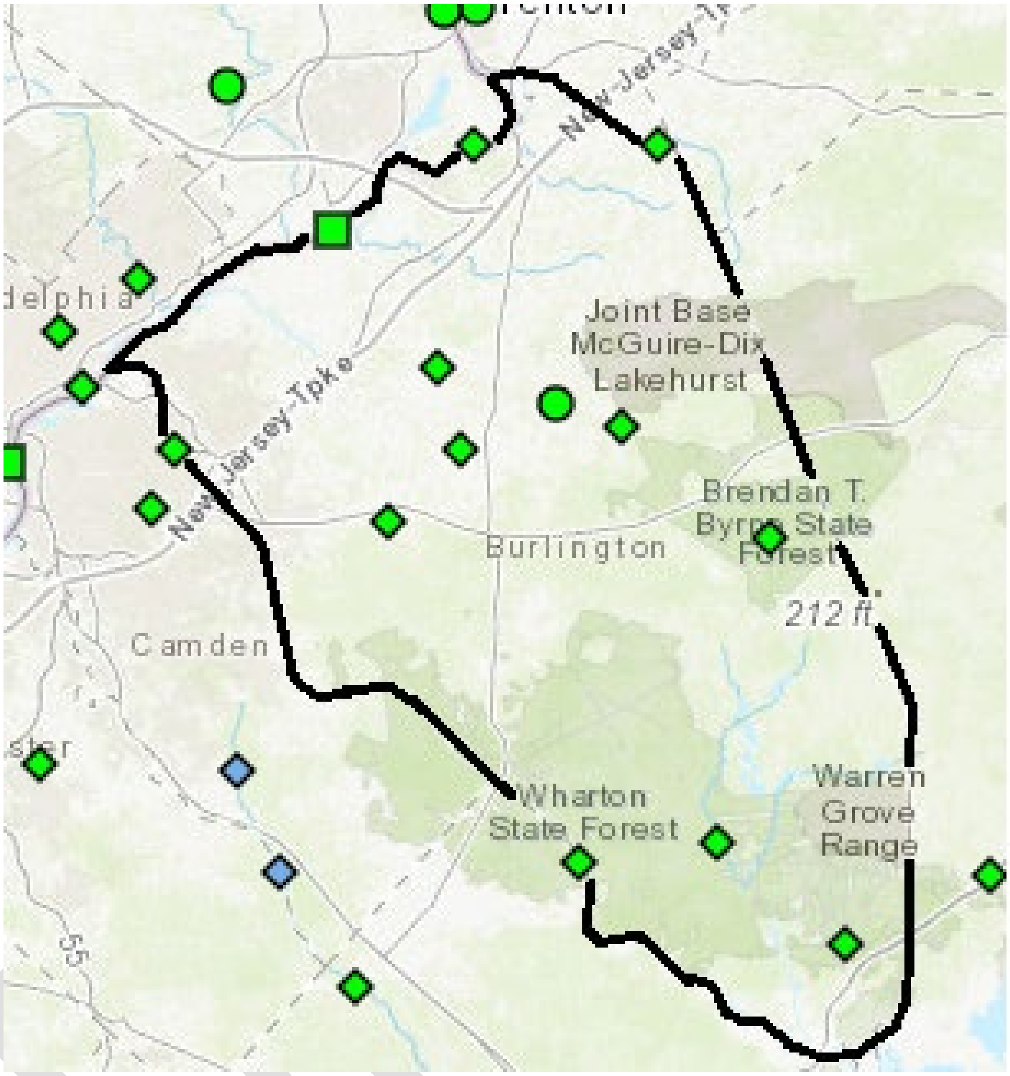
There are 11 stream gages in the County. Table 4.3.6-2 shows the stream gages in the County and details about each gage. The USGS website provides details about each of the gages (https://waterwatch.usgs.gov/index.php) and the gage heights of flooding events. The NWS provides the different flood stages for the gages (https://water.weather.gov/ahps/). Figure 4.3.6-6 displays the locations of the stream gages in the County.

### Table 4.3.6-2. Gages in Burlington County

| Gage Site Number | Site Name | Flood Stage Height (feet) | Record Flood Height (Feet) |
|---|---|---|---|
| 01464576 | Delaware River at Burlington | 9.3 feet | 11.94 feet |
| 01467005 | North Branch Rancocas Creek at Iron Works Park Mount Holly | 11.7 feet | Information Not Available |
| 01465880 | South Branch Rancocas Creek at Medford | 12 feet | 19.7 feet |
| 01465850 | South Branch Rancocas Creek at Vincentown | 7 feet | 12.34 feet |
| 01467000 | North Branch Rancocas Creek at Pemberton | 2.5 feet | 4.91 feet |
| 01466900 | Greenwood Branch at New Lisbon | 5 feet | 9.87 feet |
| 01466500 | McDonalds Branch at McDonald's Branch | None Defined | 2.54 feet |
| 01409810 | West Branch Wading River at Jenkins | 15 feet | 16.85 feet |
| 01409400 | Mullica River near Batsto | 5 feet | 7.3 feet |
| 01410150 | East Branch Bass River at New Gretna | 6 feet | 7.28 feet |
| 01410000 | Oswego River at Harrisville | 10.21 feet | 14.83 feet |

*Source: NWS 2023; USGS 2023*

Figure 4.3.6-6. Stream Gages in Burlington County




*Source: NWS 2023*

## Flash Flooding

Flash flooding, like riverine flooding, occurs throughout the County, primarily along the bodies of water that flow through it.

## Stormwater/Urban Flooding

Stormwater/urban flooding is not mapped by the State or FEMA but is most likely to occur in highly developed areas with high percentages of impervious coverage that contribute to high rates of runoff. Locations that have undersized stormwater components or stormwater components that are prone to becoming clogged or failing often experience stormwater flooding.

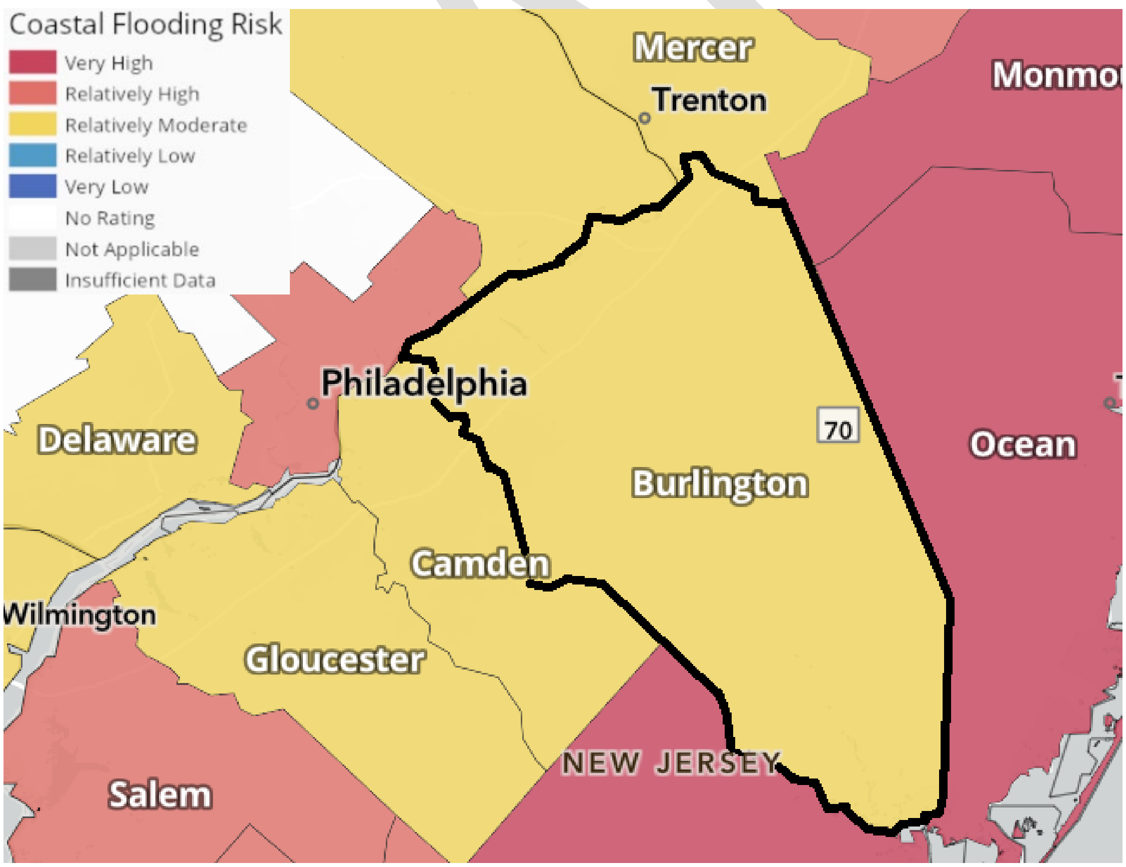
### Coastal Flooding

Portions of Burlington County experience coastal flooding from the Delaware River or Mullica River caused by extremely high tides and/or storm surge events. The reach of storm surge is dependent on the elevation of the land and the height of the storm tide. Inland communities are also vulnerable to storm surge events as rising water levels can also affect river systems, causing storm surges to travel upstream resulting in the flooding of inland areas (NOAA 2023). Refer to Section 4.3.7 Severe Storm for discussions on storm surge.

According to the United States Environmental Protection Agency (EPA), the East Coast suffers the most frequent coastal flooding and has experienced the largest increases in the number of flood days. In the EPA's Climate Indicator: Coastal Flooding, when comparing data from 1950-1959 to data from 2011-2020, the County is experiencing, on average, 5.4 more average number of flood days per year (EPA 2022).

Figure 4.3.6-7 displays the Coastal Flood Risk Index for the United States (the black circle is representative of the County vicinity). According to the National Risk Index, on the county scale, the County has a relatively moderate risk to coastal flooding; on the census tract scale (Figure 4.3.6-8), the County ranges from a very low risk to a relatively high risk for coastal flooding (FEMA 2023).

**Figure 4.3.6-7. National Risk Index, Coastal Flood Risk Index Score Using the County Scale**




*Source: FEMA 2023*



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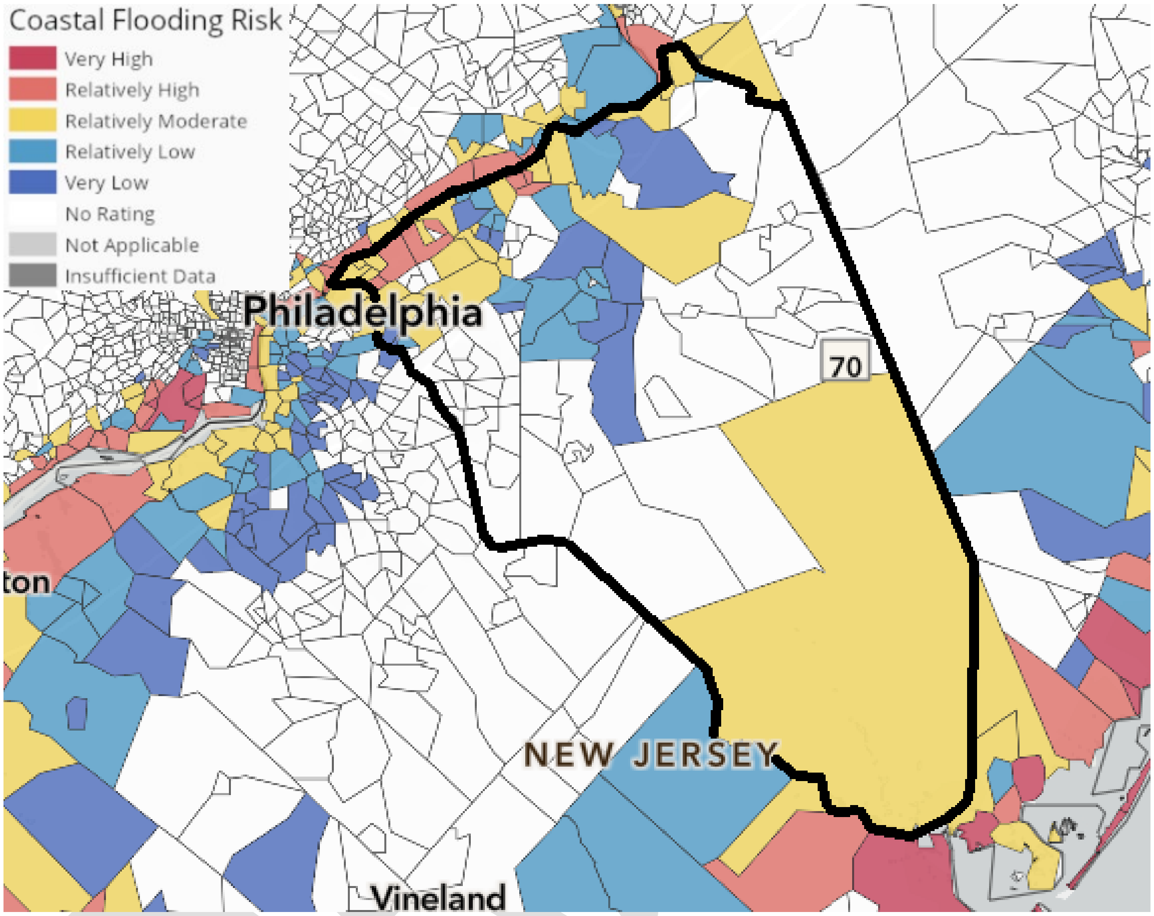
*Notes: Burlington County is outlined in bold, black lines.*

### Figure 4.3.6-8. National Risk Index, Coastal Flood Risk Index Score Using the Census Tract Scale

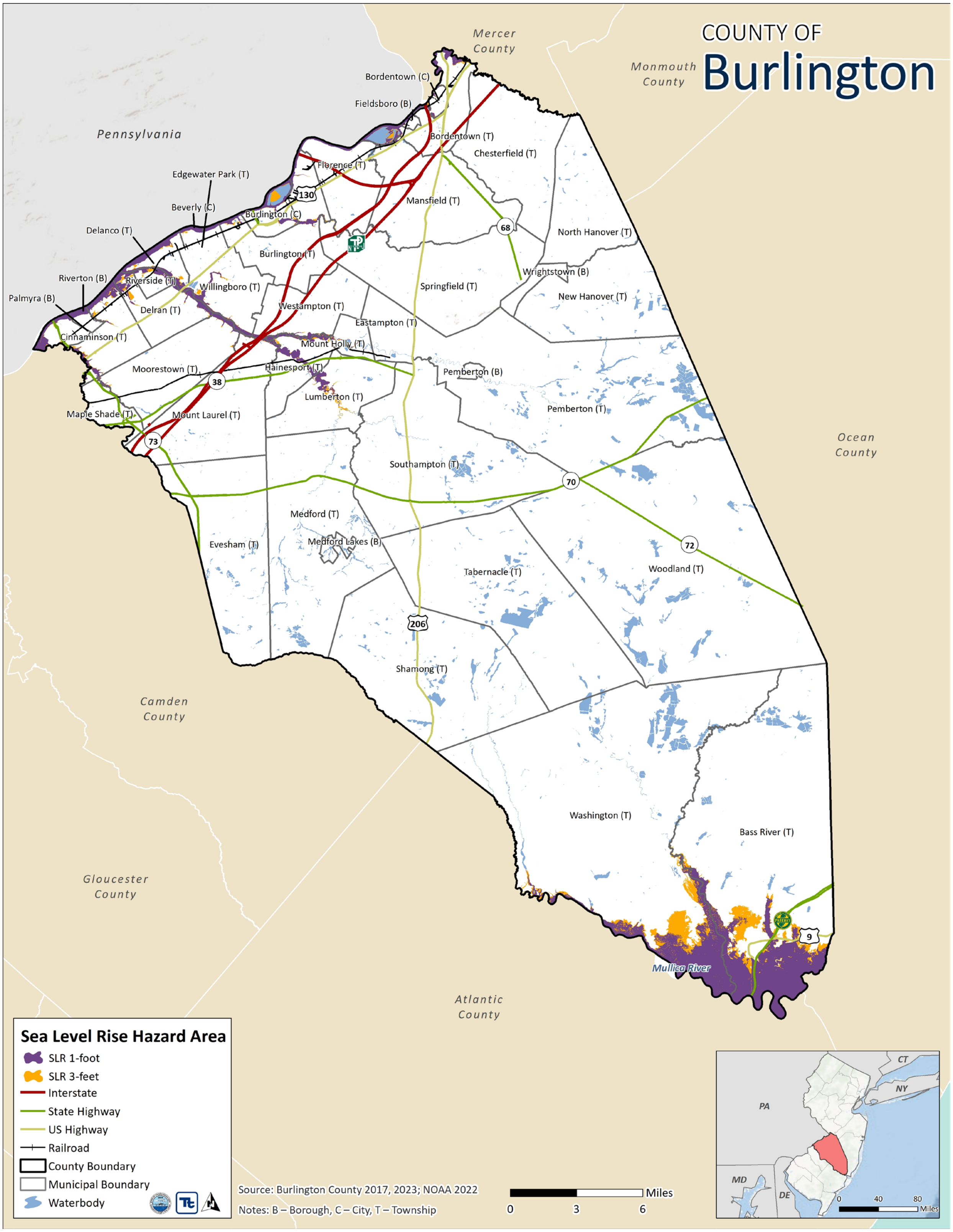



*Source: FEMA 2023*
*Notes: Burlington County is outlined in bold, black lines.*

## Sea Level Rise

Similar to riverine flooding, the area most susceptible to sea level rise are those which border the Delaware River, the Mullica River, and their tributaries. As tidal rivers, the Delaware and Mullica Rivers are subject to elevated water levels due to sea level rise; refer to Figure 4.3.6-9. According to the 2020 New Jersey Scientific Report on Climate Change, by 2050, there is a 50 percent chance that sea-level rise will meet or exceed 1.4 feet and a 17 percent chance it will exceed 2.1 feet. Those levels increase to 3.3 and 5.1 feet by the end of the century (under a moderate emission scenario). Sunny day flooding, or nuisance flooding, a type of coastal flood, will occur more often across the entire coastal area of New Jersey due to sea-level rise. As the sea level rises, the starting elevation of flooding events will also rise. This means floods are likely to reach a higher elevation and push farther inland. As a result, the floodplain will expand, and the base flood elevation will rise (NJDEP 2020).

# Figure 4.3.6-9. Sea Level Rise Hazard Areas in Burlington County



### Erosion

Erosion in the County is limited to primarily coastal or fluvial (river and stream) erosion. While Burlington County has no open water on the Atlantic Ocean or Delaware Bay, it has two distinct areas that are at risk of coastal erosion: the western border along the Delaware River and the southeastern portion along Mullica River. Meanwhile, fluvial erosion may occur along all rivers, streams, and creeks that flow throughout the County.

### Ice Jam Flooding

Ice jams are common in the northeast United States, and New Jersey is not an exception. According to USACE, New Jersey ranks 24th in the United States for total number of ice jam events, with 109 incidents documented between 1867 and 2023 (USACE 2022). Areas of New Jersey that include characteristics lending to ice jam flooding are the northern counties which border the Delaware River and its tributaries (i.e., Hunterdon, Warren, Sussex, and Mercer) and northern counties which border the Passaic River and its tributaries (i.e., Essex, Hudson, Passaic, and Bergen).

The Ice Jam Database, maintained by the Ice Engineering Group at the USACE Cold Regions Research and Engineering Laboratory (CRREL), currently consists of over 19,000 records from across the United States. According to the USACE-CRREL, Burlington County underwent has not been impacted by any historic ice jam incidents between 1780 and 2022 (USACE 2022).

## Extent

The severity of a flood event is typically determined by a combination of several factors depending on the type of flooding event.

### Riverine and Flash Flooding

The severity of riverine and flash flooding is determined by a combination of several factors including stream and river basin topography and physiography; precipitation and weather patterns; recent soil moisture conditions; and degree of vegetative clearing and impervious surface. Generally, floods are long-term events that may last for several days. Severity depends not only on the amount of water that accumulates in a period of time, but also on the land's ability to manage this water. One element is the size of rivers and streams in an area; but an equally important factor is the land's absorbency. When it rains, soil acts as a sponge. When the land is saturated or frozen, infiltration into the ground slows and any more water that accumulates must flow as runoff (Harris 2008).

The frequency and severity of riverine flooding are measured using a discharge probability, which is the probability that a certain river discharge (flow) level will be equaled or exceeded in a given year. Flood studies use historical records to determine the probability of occurrence for the different discharge levels.

In the case of riverine or flash flooding, once a river reaches flood stage, the flood extent or severity categories used by the NWS include minor flooding, moderate flooding, and major flooding. Each category has a definition based on property damage and public threat (NWS 2011):

- *Minor Flooding* – minimal or no property damage, but possibly some public threat or inconvenience.
- *Moderate Flooding* – some inundation of structures and roads near streams. Some evacuations of people and/or transfer of property to higher elevations are necessary.
- *Major Flooding* – extensive inundation of structures and roads. Significant evacuations of people and/or transfer of property to higher elevations.

### Stormwater/ Urban Flooding

Currently, there is no measurement used to further define the frequency and severity of stormwater/urban flooding.

### Coastal Flooding

Coastal flooding can cause impacts such as frequent road closures, reduced stormwater drainage capacity, and deterioration of infrastructure not designed to withstand frequent inundation or exposure to salt water. Coastal flooding can also affect human health by increasing the risk that drinking water and wastewater infrastructure will fail, putting people at risk of being exposed to pathogens and harmful chemicals (EPA 2022).

Coastal flooding can be categorized by the warnings, watches, and advisories issued by the National Weather Service (NWS). A coastal flood watch is issued when moderate-major coastal flooding is possible. A coastal flood warning is issued when moderate-major coastal flooding is actively occurring or imminent. A coastal flood advisory is issued when a minor or nuisance coastal flood is occurring or imminent for the area. All coastal flooding warnings, watches, and advisories have the potential to cause serious risk to both life and property in the County's coastal areas (NWS 2017).

### Sea Level Rise

Sea level is measured by two main methods: tide gauges and satellite laser altimeters. Tide gauge stations from around the world have measured the daily high and low tides for over a century. Using data from these stations, scientists can calculate a global average of change. Since the early 1990s, sea level has been measured from space using laser altimeters. This method determines the height of the sea surface by measuring the return speed and intensity of a laser pulse directed at the ocean. The higher the sea level, the faster and stronger the return signal (NASA Earth Observatory 2020).

### Erosion

The extent of erosion can be measured as the distance the shoreline retreats landward from the waterbody or the volume of sediment that is lost. Erosion can occur gradually over time or in episodic events, usually tied to floods.

### Ice Jam

Ice jam flooding events often occur suddenly and difficult to predict, allowing for little time to prepare for and warn of an event. Many factors will control the extent of an ice jam including the size of the snowpack, the rate of snowmelt, the size and flow of the river, and how quickly the jam releases (Rokaya 2018).

## Previous Occurrences and Losses

Historical information regarding previous occurrences and losses associated with flood events throughout New Jersey and areas within Burlington County was obtained from many sources. Given so many sources reviewed for the purpose of this HMP, loss and impact information regarding many events could vary depending on the source.

### FEMA Major Disasters and Emergency Declarations

Between May 1953 and June 2023, FEMA declared that the State of New Jersey experienced 38 flood-related disasters (DR) or emergencies (EM) classified as flooding, or as flooding with one or a combination of the following disaster types: Severe Storms; Severe Winter Storms; Inland and Coastal Flooding; Mudslides; Coastal Storm; High Tides; Heavy Rain; High Winds; and Hurricane or Tropical Storm. Generally, these disasters cover a wide region of the State; therefore, they may have impacted many counties. Burlington County was included in 15 of these flood-related declarations between 1954 and 2023, and three declarations since the 2019 Burlington County HMP. Table 4.3.6-3 lists declarations from May 1953 through June 2023 for this HMP update. Detailed information about the declared disasters since 1953 is provided in Section 3 (County Profile).

Table 4.3.6-3. FEMA Declarations for Flood Events in Burlington County

| Date(s) of Event | Date of Declaration | Event Type | FEMA Declaration Number | Burlington County included in Declaration? | Description |
|---|---|---|---|---|---|
| September 4, 1971 | September 4, 1971 | Flood | DR-310-NJ | Yes | Severe Storms and Flooding |
| July 23, 1975 | July 23, 1975 | Flood | DR-477-NJ | Yes | Severe Storms and Inland and Coastal Flooding |
| September 16-18, 1999 | September 17, 1999 | Hurricane | EM-3148-NJ | Yes | Hurricane Floyd Emergency Declarations |
| July 12-23, 2004 | July 16, 2004 | Severe Storm | DR-1530-NJ | Yes | Severe Storms and Flooding |
| August 29 – October 1, 2005 | September 19, 2005 | Hurricane | EM-3257-NJ | Yes | Hurricane Katrina Evacuations |
| April 14-20, 2007 | April 26, 2007 | Severe Storm | DR-1694-NJ | Yes | Heavy Rains, Severe Storms, Hail, and Tornadoes |
| March 12 – April 15, 2010 | April 2, 2010 | Severe Storm | DR-1897-NJ | Yes | Heavy Rains and Flooding |
| August 26 – September 5, 2011 | August 27, 2011 | Hurricane | EM-3332-NJ | Yes | Hurricane Irene |
| August 26 – September 5, 2011 | August 31, 2011 | Hurricane | DR-4021-NJ | Yes | Hurricane Irene |
| October 26 – November 8, 2012 | October 28, 2012 | Hurricane | EM-3354-NJ | Yes | Hurricane Sandy |

| Date(s) of Event | Date of Declaration | Event Type | FEMA Declaration Number | Burlington County included in Declaration? | Description |
| --- | --- | --- | --- | --- | --- |
| October 26 – November 8, 2012 | October 30, 2012 | Hurricane | DR-4086-NJ | Yes | Hurricane Sandy |
| June 23, 2015 | July 22, 2015 | Severe Storm | DR-4231-NJ | Yes | Severe Storm |
| January 22-24, 2016 | March 14, 2016 | Severe Storm | DR-4264-NJ | Yes | Severe Winter Storm and Snowstorm |
| March 6-7, 2018 | June 8, 2018 | Severe Storm | DR-4368-NJ | Yes | Severe Winter Storm and Snowstorm |
| August 4, 2020 | December 11, 2020 | Tropical Storm | DR-4574-NJ | Yes | New Jersey Tropical Storm Isaias |
| September 1-3, 2021 | September 3, 2021 | Hurricane | EM-3573-NJ | Yes | New Jersey Remnants of Hurricane Ida |
| September 1-3, 2021 | September 3, 2021 | Hurricane | DR-4614-NJ | Yes | New Jersey Remnants of Hurricane Ida |

*Source: FEMA 2023*

## U.S. Department of Agriculture Disaster Declarations

The Secretary of Agriculture from the U.S. Department of Agriculture (USDA) is authorized to designate counties as disaster areas to make emergency loans to producers suffering losses in those counties and in counties that are contiguous to a designated county. Between August 2018 and June 2023, Burlington County was included in one flood-related agricultural disaster declarations.

### Table 4.3.6-4. USDA Declarations for Flood Events in Burlington County

| Date(s) of Event | Event Type | Declaration Number | Description |
| --- | --- | --- | --- |
| April 1 – June 21, 2019 | Flood, Flash Flood | S4519 | Excessive rain, flash flooding, and flooding |

*Source: USDA 2023*

## Previous Events

For the 2024 HMP update, known flood events that impacted Burlington County between August 2018 and March 2023 are discussed below. For events prior to August 2018, refer to the 2019 Burlington County HMP.

## Table 4.3.6-5. Flood Events in Burlington County, 2018 to 2023

| Date(s) of Event | Event Type | Declaration Number (if applicable) | Burlington County included in Declaration? | Description |
|---|---|---|---|---|
| August 13, 2018 | Flash Flood | N/A | N/A | Heavy rain resulted in widespread flash flooding in Burlington County. Heavy rain resulted in widespread roadway flooding in Palmyra, Maple Shade, and Moorestown. Sections of Route 73 and Route 38 were closed due to flooding. There were no property or crop damages reported from this event in the County. |
| August 31, 2018 | Flash Flood | N/A | N/A | Locally heavy rain produced flash flooding in parts of Burlington County on the morning of August 31. Rainfall totals of 2.5 to 5.5 inches fell in a short amount of time. Heavy rain produced flash flooding on Route 530 just east of Route 206 in Southampton Township. There were no property or crop damages reported from this event in the County. |
| September 9-11, 2018 | Coastal Flood | N/A | N/A | A weather system caused widespread moderate coastal flooding. The flooding occurred across three consecutive high tide cycles. Moderate flooding occurred along the tidal waterways in Southeastern Burlington County. The tide gauge at Burlington reached 10.62 feet. There were no property or crop damages reported from this event in the County. |
| September 25, 2018 | Flash Flood | N/A | N/A | A quick 1 to 2 inches of rain fell in Burlington County during the late afternoon and early evening of September 25. Widespread roadway flooding in Delran Township. There were no property or crop damages reported from this event in the County. |
| October 27, 2018 | Coastal Flood | N/A | N/A | A weather system brought moderate to major coastal flooding and high winds to Burlington County. Moderate to major coastal flooding occurred along the tidal waterways of southeastern Burlington County. There was roadway flooding with water reaching some structures. There were several road closures along the Mullica River in Lower Bank and vicinity. There were no property or crop damages reported from this event in the County. |
| November 25-26, 2018 | Coastal Flood | N/A | N/A | A coastal storm resulted in moderate tidal flooding along the Delaware River and its tidal tributaries. Some roads were flooded. The tide gauge at Burlington reached 10.78 feet. There were no property or crop damages reported from this event in the County. |
| May 29, 2019 | Flash Flood | N/A | N/A | Strong to severe thunderstorms brought heavy rain; totals of 1 to 2 inches fell in a short amount of time, with some locally higher amounts reported. Widespread roadway flooding in Riverside and Delran. Many roads were impassable. There were no property or crop damages reported from this event in the County. |

| Date(s) of Event | Event Type | Declaration Number (if applicable) | Burlington County included in Declaration? | Description |
| --- | --- | --- | --- | --- |
| June 19-20, 2019 | Flash Flood | S4519 | Yes | Showers and thunderstorms produced heavy rainfall and flash flooding. Rainfall amounts of 3 to near 6 inches were reported in Burlington County, causing significant flash flooding. Widespread roadway flooding occurred in Burlington City, Burlington Township, Pemberton Township, Southampton, Medford, Evesham, Maple Shade, and Moorestown, resulting in several road closures. A few vehicles were trapped temporarily in the flood waters. The Rancocas Creek experienced flooding in Pemberton Township, Mount Holly, and Medford. A total of 28 homes were evacuated in the Southampton Township. A state of emergency was declared by Governor Phil Murphy. There were no property or crop damages reported from this event in the County. |
| July 5, 2019 | Flash Flood | N/A | N/A | Thunderstorms brought locally heavy rain; 1 to around 2 inches fell in spots. Heavy rain resulted in widespread roadway flooding in Pemberton Township. There were no property or crop damages reported from this event in the County. |
| July 6, 2020 | Flash Flood | N/A | N/A | Thunderstorms brought heavy rain; totals were as high as 2 to 4 inches fell in parts of the State. Union Mill Road in Mount Laurel was closed due to flooding. Ramblewood Parkway in Mount Laurel was inundated. Flash flooding occurred in Moorestown. West Central Avenue was impassable. Marter Avenue was inundated. There were no property or crop damages reported from this event in the County. |
| August 4, 2020 | Coastal Flood | DR-4574-NJ | Yes | Tropical Storm Isaias caused moderate tidal flooding. There was roadway flooding in some of the tidal areas of northwestern Burlington County along the Delaware River and its tidal tributaries. There were no property or crop damages reported from this event in the County. |
| August 12, 2020 | Flash Flood | N/A | N/A | Thunderstorms brought locally heavy rain; totals were as high as 2 to 4 inches. Several water rescues took place in Maple Shade. NJ Route 38 was closed near South Lenola Road in Maple Shade. There were no property or crop damages reported from this event in the County. |
| June 9, 2021 | Flash Flood | N/A | N/A | Thunderstorms brought locally heavy rain; totals of 2 to 3 inches occurred in the far northwestern part of Burlington County. Widespread roadway flooding occurred in Edgewater Park. There were no property or crop damages reported from this event in the County. |
| July 12, 2021 | Flash Flood | N/A | N/A | Thunderstorms brought locally heavy rain; rainfall totals up to 5 to 8 inches occurred in Burlington County prompting the issuance of a Flash Flood Emergency. Widespread roadway flooding occurred in Florence Township, Burlington City, Burlington Township, Edgewater Park, Beverly, Palmyra, Delanco, and Riverside |

| Date(s) of Event | Event Type | Declaration Number (if applicable) | Burlington County included in Declaration? | Description |
|---|---|---|---|---|
| | | | | causing numerous road closures. There were several water rescues. There were no property or crop damages reported from this event in the County. |
| July 21, 2021 | Flash Flood | N/A | N/A | Thunderstorms brought locally heavy rain; there were rainfall totals up to 2 to 4 inches. Widespread roadway flooding occurred in Lumberton. There were no property or crop damages reported from this event in the County. |
| July 29, 2021 | Flash Flood | N/A | N/A | Thunderstorms brought locally heavy rainfall, as much as 2 to 5 inches of rain fell in parts of the area. Beechwood Avenue and Pinewald Lane in Burlington Township became impassable due to flooding. There were no property or crop damages reported from this event in the County. |
| August 10, 2021 | Flash Flood | N/A | N/A | Thunderstorms produced locally heavy rain in northern Burlington County. Rainfall totals were up to 2 to 4 inches. Flooding occurred at interchange 52 on Interstate 295 in Mansfield Township. The northbound ramp to Columbus Road was closed. Also, US Route 206 southbound was closed at Hedding Road in Mansfield Township. There were no property or crop damages reported from this event the County. |
| September 1-3, 2021 | Coastal Flood, Flash Flood | EM-3573-NJ, DR-4614-NJ | Yes | Runoff from the heavy rain associated with Post Tropical Cyclone Ida produced moderate to major flooding along the tidal Delaware River on September 1 and 2, inundating adjacent roadways and properties. The tide gauge at Burlington, New Jersey tied its record level of 11.94 feet. NJ Route 73 in Palmyra was closed due to flooding. There were no property or crop damages reported from this event in the County. |
| October 28-29, 2021 | Coastal Flood | N/A | N/A | A weather system caused moderate to major flooding along the tidal Delaware River and its tributaries between October 28 and 29. There were many road closures with the flood waters affecting numerous homes and businesses. The tide gauge at Burlington reached a level of 11.30 feet. There were no property or crop damages reported from this event in the County. |
| October 3-4, 2022 | Coastal Flood | N/A | N/A | A weather system caused widespread roadway flooding and some property inundation occurred in the tidal areas of southeastern Burlington County. There were no property or crop damages reported from this event in the County. |
| December 23, 2022 | Coastal Flood | N/A | N/A | A weather system produced tidal flooding in New Jersey, resulting in widespread roadway flooding in the tidal communities of northwestern Burlington County. The flood waters affected some vulnerable buildings. The tide gauge at Burlington reached 10.77 feet. There were no property or crop damages reported from this event in the County. |

| Date(s) of Event | Event Type | Declaration Number (if applicable) | Burlington County included in Declaration? | Description |
|---|---|---|---|---|
| April 15, 2023 | Flash Flood | N/A | N/A | Thunderstorms produced locally heavy rain, leading to rainfall totals as high as 2.0 to 3.5 inches. Larchmont Boulevard in Mount Laurel Township was closed at Willow Turn due to flooding. The water was up to 2 or 3 feet deep, and one vehicle became stranded. $3,000 in property damages were reported from this event in the County. |

*Source: NOAA NCEI 2023; FEMA 2023; USDA 2023*

## Probability of Future Occurrence

For the 2024 HMP update, the most up-to-date data was collected to calculate the probability of future occurrence of flood events for the County. Information from NOAA-NCEI storm events database, the 2020 State of New Jersey HMP, the 2020 Burlington County HMP, and the United States Army Corps of Engineers Cold Regions Research and Engineering Laboratory (USACE CRREL) were used to identify the number of flood events that occurred between January 1950 and March 2023. Table 4.3.6-6 presents the probability of future events for flood in Burlington County.

### Table 4.3.6-6. Probability of Future Occurrences of Flood Events

| Hazard Type | Occurrences Between 1950 and 2023 | % Chance of Occurring in Any Given Year |
|---|---|---|
| Coastal Flood | 53 | 72.60% |
| Flash Flood | 52 | 71.23% |
| Flood | 38 | 52.05% |
| Ice Jam | 0 | 0 |
| **Total** | **143** | **100%** |

*Source: NOAA 2023; USACE 2022; FEMA 2023*
*Note: Disaster occurrences include federally declared disasters since the 1950 Federal Disaster Relief Act, and selected events since 1968. Due to limitations in data, not all flood events occurring between 1954 and 1996 are accounted for in the tally of occurrences. As a result, the number of hazard occurrences is underestimated.*

In Section 4.4, the identified hazards of concern for the County were ranked (Table 4.4-2). The probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. Based on historical records and input from the Planning Team, the probability of occurrence for flooding in the County is considered 'frequent'.

## Climate Change Impacts

Providing projections of future climate change for a specific region is challenging. Shorter term projections are more closely tied to existing trends making longer term projections even more challenging. The further out a prediction reaches the more subject to changing dynamics it becomes.

Climate change includes major changes in temperature, precipitation, or wind patterns, which occur over several decades or longer. Due to the increase in greenhouse gas concentrations since the end of the 1890s, New Jersey has experienced a 3.5° F (1.9° C) increase in the State's average temperature, which is faster than the rest of the Northeast region (2° F [1.1° C]) and the world (1.5° F [0.8° C]) (IPCC 2014). This warming trend is expected to continue. By 2050, temperatures in New Jersey are expected to increase by 4.1 to 5.7° F (2.3° C to 3.2° C). Thus, New Jersey can expect to experience an average annual temperature that is warmer than any to date (low emissions scenario) and future temperatures could be as much as 10° F (5.6° C) warmer (high emissions scenario). New Jersey can also expect that by the middle of the 21st century, 70 percent of summers will be hotter than the warmest summer experienced to date. The increase in temperatures is expected to be felt more during the winter months (December, January, and February), resulting in less intense cold waves, fewer sub-freezing days, and less snow accumulation. Changes in winter temperatures could result in a change in the frequency of ice jam events (NJDEP 2020).

As temperatures increase, Earth's atmosphere can hold more water vapor which leads to a greater potential for precipitation. Currently, New Jersey receives an average of 46 inches of precipitation each year. Since the end of the twentieth century, New Jersey has experienced slight increases in the amount of precipitation it receives each year, and over the last 10 years there has been a 7.9 percent increase. By 2050, annual precipitation in New Jersey could increase by 4 percent to 11 percent. By the end of this century, heavy precipitation events are projected to occur two to five times more often and with more intensity than in the last century. New Jersey will experience more intense rain events, less snow, and more rainfalls. Also, small decreases in the amount of precipitation may occur in the summer months, resulting in greater potential for more frequent and prolonged droughts. New Jersey could also experience an increase in the number of flood events (NJDEP 2020).

A warmer atmosphere means storms have the potential to be more intense and occur more often. In New Jersey, extreme storms typically include coastal nor'easters, snowstorms, spring and summer thunderstorms, tropical storms, and on rare occasions hurricanes. Most of these events occur in the warmer months between April and October, with nor'easters occurring between September and April. Over the last 50 years, in New Jersey, storms that resulted in extreme rain increased by 71 percent which is a faster rate than anywhere else in the United States (NJDEP 2020).

## Vulnerability Assessment

To assess Burlington County's risk to the flood hazard, a spatial analysis was conducted using the FEMA Risk Map effective dated 2019. The depth grid was developed for the 2023 Burlington County HMP using data from USGS's 1-meter Resolution Digital Elevation Model from 2021. The 1- and 0.2-percent annual chance flood events were examined to determine the assets located in the hazard areas and to estimate potential loss using the FEMA Hazus flood model.

Sea level rise 1-foot and 3-foot hazard data was source from NOAA. For this risk assessment, the sea level rise hazard area data was utilized to determine what assets are exposed. Population, general building stock, critical facility, and anticipated new development datasets were overlaid with the hazard area. Assets with their centroid in the hazard area were totaled to estimate the risk associated with impacts from sea level rise, in regard to building RCV and vulnerable populations. These results are summarized below.

### Impact on Life, Health, and Safety

The impact of flooding on life, health, and safety is dependent upon several factors, including the severity of the event and whether or not adequate warning time is provided to residents. The total number of injuries and casualties resulting from flooding is generally limited based on advance weather forecasting, blockades, and warnings. More likely, persons could become displaced from their homes or may seek shelter due to the impacts of a flood event. Therefore, injuries and deaths generally are not anticipated if proper warning and precautions are in place. Ongoing mitigation efforts should help to avoid the most likely cause of injury, which results from persons trying to cross flooded roadways or channels during a flood.

Exposure represents the population living in or near floodplain areas that could be impacted should a flood event occur. Additionally, exposure should not be limited to only those who reside in a defined hazard zone, but everyone who may be affected by the effects of a hazard event (e.g., people are at risk while traveling in flooded areas, or their access to emergency services is compromised during an event). The degree of that impact will vary and is not strictly measurable.

To estimate population exposure to the 1-percent and 0.2-percent annual chance flood events, the DFIRM flood boundaries were used. Based on the spatial analysis, there are an estimated 14,583 residents living in the 1-percent annual chance floodplain, or 3.2 percent of the County's total population. The City of Burlington has the greatest number of residents living in the floodplain, with approximately 6,237 residents living in the 1-percent annual chance floodplain. Based on the same analysis, there are an estimated 25,026 residents living in the 0.2-percent annual chance floodplain, or 5.4 percent of the County's total population. The City of Burlington has the greatest number of residents living in the floodplain, with approximately 7,548 residents living in the 0.2-percent annual chance floodplain. Table 4.3.6-7 summarizes the population exposed to the flood hazard by jurisdiction.

### Table 4.3.6-7. Estimated Population Exposed to the 1-percent and 0.2-percent Annual Chance Flood Event Hazard Area

| Jurisdiction | Total Population (Decennial Population 2020) | Estimated Population Located in the Flood Hazard Area | | | |
|---|---|---|---|---|---|
| | | Number of Persons Located in the 1-percent Annual Chance Flood Event Hazard Area | Percent of Total | Number of Persons Located in the 0.2-percent Annual Chance Flood Event Hazard Area | Percent of Total |
| **Bass River (T)** | 1,355 | 440 | 32.5% | 676 | 49.9% |
| **Beverly (C)** | 2,499 | 26 | 1.0% | 177 | 7.1% |
| **Bordentown (C)** | 3,993 | 39 | 1.0% | 48 | 1.2% |
| **Bordentown (T)** | 11,791 | 38 | 0.3% | 61 | 0.5% |
| **Burlington (C)** | 9,743 | 6,237 | 64.0% | 7,548 | 77.5% |
| **Burlington (T)** | 23,983 | 202 | 0.8% | 995 | 4.2% |
| **Chesterfield (T)** | 9,422 | 9 | 0.1% | 9 | 0.1% |
| **Cinnaminson (T)** | 17,064 | 861 | 5.0% | 1,559 | 9.1% |
| **Delanco (T)** | 4,824 | 233 | 4.8% | 1,255 | 26.0% |
| **Delran (T)** | 17,882 | 518 | 2.9% | 787 | 4.4% |
| **Eastampton (T)** | 6,191 | 192 | 3.1% | 213 | 3.4% |
| **Edgewater Park (T)** | 8,930 | 9 | 0.1% | 26 | 0.3% |
| **Evesham (T)** | 46,826 | 284 | 0.6% | 380 | 0.8% |
| **Fieldsboro (B)** | 526 | 3 | 0.5% | 3 | 0.5% |
| **Florence (T)** | 12,812 | 21 | 0.2% | 21 | 0.2% |
| **Hainesport (T)** | 6,035 | 153 | 2.5% | 177 | 2.9% |
| **Lumberton (T)** | 12,803 | 410 | 3.2% | 434 | 3.4% |
| **Mansfield (T)** | 8,897 | 8 | 0.1% | 8 | 0.1% |

| Jurisdiction | Total Population (Decennial Population 2020) | Estimated Population Located in the Flood Hazard Area | | | |
|---|---|---|---|---|---|
| | | Number of Persons Located in the 1-percent Annual Chance Flood Event Hazard Area | Percent of Total | Number of Persons Located in the 0.2-percent Annual Chance Flood Event Hazard Area | Percent of Total |
| **Maple Shade (T)** | 19,980 | 93 | 0.5% | 301 | 1.5% |
| **Medford (T)** | 24,497 | 308 | 1.3% | 537 | 2.2% |
| **Medford Lakes (B)** | 4,264 | 164 | 3.8% | 171 | 4.0% |
| **Moorestown (T)** | 21,355 | 321 | 1.5% | 459 | 2.1% |
| **Mount Holly (T)** | 9,981 | 306 | 3.1% | 996 | 10.0% |
| **Mount Laurel (T)** | 44,633 | 307 | 0.7% | 1,431 | 3.2% |
| **New Hanover (T)** | 6,367 | 173 | 2.7% | 173 | 2.7% |
| **North Hanover (T)** | 7,963 | 54 | 0.7% | 54 | 0.7% |
| **Palmyra (B)** | 7,438 | 470 | 6.3% | 2,444 | 32.9% |
| **Pemberton (B)** | 1,371 | 3 | 0.2% | 6 | 0.4% |
| **Pemberton (T)** | 26,903 | 868 | 3.2% | 1,002 | 3.7% |
| **Riverside (T)** | 8,003 | 463 | 5.8% | 948 | 11.8% |
| **Riverton (B)** | 2,764 | 80 | 2.9% | 580 | 21.0% |
| **Shamong (T)** | 6,460 | 93 | 1.4% | 102 | 1.6% |
| **Southampton (T)** | 10,317 | 258 | 2.5% | 288 | 2.8% |
| **Springfield (T)** | 3,245 | 22 | 0.7% | 22 | 0.7% |
| **Tabernacle (T)** | 6,776 | 16 | 0.2% | 18 | 0.3% |
| **Washington (T)** | 693 | 181 | 26.2% | 283 | 40.8% |
| **Westampton (T)** | 9,121 | 126 | 1.4% | 137 | 1.5% |
| **Willingboro (T)** | 31,889 | 578 | 1.8% | 681 | 2.1% |
| **Woodland (T)** | 1,544 | 15 | 1.0% | 18 | 1.2% |
| **Wrightstown (B)** | 720 | 0 | 0.0% | 0 | 0.0% |
| **Burlington County (Total)** | **461,860** | **14,583** | **3.2%** | **25,026** | **5.4%** |

*Source: Burlington County, 2023; NJOGIS 2023; Microsoft BING 2022; U.S. Census Bureau 2020; FEMA 2019*

To estimate population exposure to sea level rise, the 1-foot and 3-foot hazard data was sourced from NOAA. Based on the spatial analysis, there are an estimated 225 residents living in the Sea Level Rise 1-foot Hazard Area, or <0.1-percent of the County's total population. The Township of Cinnaminson has the greatest number of residents living in the hazard area, with approximately 38 residents living in the Sea Level Rise 1-foot Hazard Area. Based on the same analysis, there are an estimated 677 residents living in the Sea Level Rise 3-foot Hazard Area, or 0.1-percent of the County's total population. The Township of Cinnaminson has the greatest number of residents living in the hazard area, with approximately 226 residents living in the Sea Level Rise 3-foot Hazard Area. Table 4.3.6-8 summarizes the population exposed to the hazard area by jurisdiction.

## Table 4.3.6-8. Estimated Population Exposed to the Sea Level Rise 1-foot Hazard Area and Sea Level Rise 3-foot Hazard Area

| Jurisdiction | Total Population (Decennial Population 2020) | Estimated Population Located in Sea Level Rise 1-foot Hazard Area | | Estimated Population Located in Sea Level Rise 3-foot Hazard Area | |
|---|---|---|---|---|---|
| | | Number of People | Percent of Total | Number of People | Percent of Total |
| **Bass River (T)** | 1,355 | 21 | 1.6% | 51 | 3.8% |
| **Beverly (C)** | 2,499 | 0 | 0.0% | 0 | 0.0% |
| **Bordentown (C)** | 3,993 | 4 | 0.1% | 4 | 0.1% |
| **Bordentown (T)** | 11,791 | 15 | 0.1% | 19 | 0.2% |
| **Burlington (C)** | 9,743 | 11 | 0.1% | 18 | 0.2% |
| **Burlington (T)** | 23,983 | 0 | 0.0% | 0 | 0.0% |
| **Chesterfield (T)** | 9,422 | 9 | 0.1% | 9 | 0.1% |
| **Cinnaminson (T)** | 17,064 | 38 | 0.2% | 226 | 1.3% |
| **Delanco (T)** | 4,824 | 6 | 0.1% | 12 | 0.2% |
| **Delran (T)** | 17,882 | 0 | 0.0% | 91 | 0.5% |
| **Eastampton (T)** | 6,191 | 0 | 0.0% | 0 | 0.0% |
| **Edgewater Park (T)** | 8,930 | 4 | <0.1% | 4 | <0.1% |
| **Evesham (T)** | 46,826 | 0 | 0.0% | 0 | 0.0% |
| **Fieldsboro (B)** | 526 | 3 | 0.5% | 3 | 0.5% |
| **Florence (T)** | 12,812 | 0 | 0.0% | 0 | 0.0% |
| **Hainesport (T)** | 6,035 | 8 | 0.1% | 13 | 0.2% |
| **Lumberton (T)** | 12,803 | 32 | 0.2% | 60 | 0.5% |
| **Mansfield (T)** | 8,897 | 0 | 0.0% | 0 | 0.0% |
| **Maple Shade (T)** | 19,980 | 8 | <0.1% | 8 | <0.1% |
| **Medford (T)** | 24,497 | 0 | 0.0% | 0 | 0.0% |
| **Medford Lakes (B)** | 4,264 | 0 | 0.0% | 0 | 0.0% |
| **Moorestown (T)** | 21,355 | 30 | 0.1% | 33 | 0.2% |
| **Mount Holly (T)** | 9,981 | 0 | 0.0% | 7 | 0.1% |
| **Mount Laurel (T)** | 44,633 | 0 | 0.0% | 4 | <0.1% |
| **New Hanover (T)** | 6,367 | 0 | 0.0% | 0 | 0.0% |
| **North Hanover (T)** | 7,963 | 0 | 0.0% | 0 | 0.0% |
| **Palmyra (B)** | 7,438 | 10 | 0.1% | 16 | 0.2% |
| **Pemberton (B)** | 1,371 | 0 | 0.0% | 0 | 0.0% |
| **Pemberton (T)** | 26,903 | 0 | 0.0% | 0 | 0.0% |
| **Riverside (T)** | 8,003 | 0 | 0.0% | 10 | 0.1% |
| **Riverton (B)** | 2,764 | 3 | 0.1% | 3 | 0.1% |
| **Shamong (T)** | 6,460 | 0 | 0.0% | 0 | 0.0% |
| **Southampton (T)** | 10,317 | 0 | 0.0% | 0 | 0.0% |
| **Springfield (T)** | 3,245 | 0 | 0.0% | 0 | 0.0% |
| **Tabernacle (T)** | 6,776 | 0 | 0.0% | 0 | 0.0% |

| Jurisdiction | Total Population (Decennial Population 2020) | Estimated Population Located in Sea Level Rise 1-foot Hazard Area | | Estimated Population Located in Sea Level Rise 3-foot Hazard Area | |
|---|---|---|---|---|---|
| | | Number of People | Percent of Total | Number of People | Percent of Total |
| **Washington (T)** | 693 | 18 | 2.6% | 39 | 5.6% |
| **Westampton (T)** | 9,121 | 0 | 0.0% | 22 | 0.2% |
| **Willingboro (T)** | 31,889 | 6 | <0.1% | 24 | 0.1% |
| **Woodland (T)** | 1,544 | 0 | 0.0% | 0 | 0.0% |
| **Wrightstown (B)** | 720 | 0 | 0.0% | 0 | 0.0% |
| **Burlington County Total** | **461,860** | **225** | **<0.1%** | **677** | **0.1%** |

*Source: Burlington County, 2023; NJOGIS 2023; Microsoft BING 2022; U.S. Census Bureau 2020; NOAA 2022*

### Socially Vulnerable Populations

Research has shown that some populations, while they may not have more hazard exposure, may experience exacerbated impacts and prolonged recovery if/when impacted. This is due to many factors, including their physical and financial ability to react or respond during a hazard. Of the population exposed, the most vulnerable include the economically disadvantaged and the population over age 65. Economically disadvantaged populations may be more vulnerable because they are likely to evaluate their risk and make decisions to evacuate based on net economic impacts on their families. The population over age 65 is also more vulnerable because they are more likely to seek or need medical attention that may not be available due to isolation during a flood event, and they may have more difficulty evacuating. According to the 2021 5-year ACS estimates, there are 27,947 total persons living below the poverty level, 78,093 persons over the age of 65 years, 23,350 persons under the age of 5 years, 9,103 non-English speakers, and 51,899 persons with a disability in Burlington County.

The Centers for Disease Control and Prevention (CDC) 2020 Social Vulnerability Index (SVI) ranks U.S. Census tracts on socioeconomic status, household composition and disability, minority status and language, and housing and transportation. Burlington County's overall national score is 0.2648 and a state score of 0.3, both indicating that its communities have a low to medium level of social vulnerability (CDC 2020). This score indicates that some County residents may not have enough resources to respond to flood events.

Using 2021 American Community Survey (ACS) data, Hazus estimates the potential sheltering needs as a result of a 1-percent annual chance flood event. For the 1-percent flood event, Hazus estimates 19,651 individuals will be displaced, and 2,204 people will seek short-term sheltering. These statistics, by jurisdiction and by flood zone, are presented in Table 4.3.6-9.

Table 4.3.6-9. Estimated Population Displaced or Seeking Short-Term Shelter from the 1-percent Annual Chance Flood Event Hazard Area

| Jurisdiction | Total Population (American Community Survey 2021) | 1-Percent Annual Chance Flood Event | |
|---|---|---|---|
| | | Displaced Population | Persons Seeking Short-Term Sheltering |
| **Bass River (T)** | 1,355 | 386 | 30 |
| **Beverly (C)** | 2,499 | 116 | 17 |
| **Bordentown (C)** | 3,993 | 41 | 8 |
| **Bordentown (T)** | 11,791 | 139 | 32 |
| **Burlington (C)** | 9,743 | 7,292 | 430 |
| **Burlington (T)** | 23,983 | 237 | 34 |
| **Chesterfield (T)** | 9,422 | 16 | 3 |
| **Cinnaminson (T)** | 17,064 | 1,165 | 37 |
| **Delanco (T)** | 4,824 | 342 | 46 |
| **Delran (T)** | 17,882 | 530 | 102 |
| **Eastampton (T)** | 6,191 | 127 | 22 |
| **Edgewater Park (T)** | 8,930 | 1 | 0 |
| **Evesham (T)** | 46,826 | 777 | 205 |
| **Fieldsboro (B)** | 526 | 16 | 2 |
| **Florence (T)** | 12,812 | 43 | 7 |
| **Hainesport (T)** | 6,035 | 183 | 6 |
| **Lumberton (T)** | 12,803 | 349 | 48 |
| **Mansfield (T)** | 8,897 | 43 | 17 |
| **Maple Shade (T)** | 19,980 | 382 | 76 |
| **Medford (T)** | 24,497 | 650 | 86 |
| **Medford Lakes (B)** | 4,264 | 273 | 1 |
| **Moorestown (T)** | 21,355 | 496 | 115 |
| **Mount Holly (T)** | 9,981 | 582 | 120 |
| **Mount Laurel (T)** | 44,633 | 826 | 187 |
| **New Hanover (T)** | 6,367 | 17 | 5 |
| **North Hanover (T)** | 7,963 | 33 | 14 |
| **Palmyra (B)** | 7,438 | 967 | 54 |
| **Pemberton (B)** | 1,371 | 10 | 4 |
| **Pemberton (T)** | 26,903 | 1,099 | 188 |
| **Riverside (T)** | 8,003 | 510 | 57 |
| **Riverton (B)** | 2,764 | 118 | 2 |
| **Shamong (T)** | 6,460 | 166 | 26 |
| **Southampton (T)** | 10,317 | 374 | 51 |
| **Springfield (T)** | 3,245 | 49 | 3 |
| **Tabernacle (T)** | 6,776 | 34 | 9 |

| Jurisdiction | Total Population (American Community Survey 2021) | 1-Percent Annual Chance Flood Event | |
|---|---|---|---|
| | | Displaced Population | Persons Seeking Short-Term Sheltering |
| **Washington (T)** | 693 | 198 | 6 |
| **Westampton (T)** | 9,121 | 261 | 32 |
| **Willingboro (T)** | 31,889 | 779 | 115 |
| **Woodland (T)** | 1,544 | 17 | 5 |
| **Wrightstown (B)** | 720 | 8 | 2 |
| **Burlington County (Total)** | **461,860** | **19,651** | **2,204** |

*Source: Hazus v6.0*

### Impact on General Building Stock

Exposure to the flood hazard includes those buildings located in the flood zone or those that are built downstream in other flood inundation areas such as dam failure inundation areas. The potential damage is the modeled loss that could occur to the exposed inventory measured by the structural and content replacement cost value. There are an estimated 5,163 buildings in the 1-percent annual flood chance event, representing approximately 5.6-percent of the County's total general building stock inventory replacement cost value. The City of Burlington has the greatest number of its buildings located in the 1-percent annual chance floodplain (2,083 buildings or 65.8-percent of its total building stock). There are an estimated 8,739 buildings in the 0.2-percent annual flood chance event, representing approximately 8.4-percent of the County's total general building stock inventory replacement cost value. The City of Burlington also has the greatest number of its buildings located in the 0.2-percent annual chance floodplain (2,524 buildings or 79.7 percent of its total building stock). Refer to Table 4.3.6-10 and Table 4.3.6-11 for the estimated exposure of 1-percent and 0.2-percent flood events by jurisdiction. Refer to Table 4.3.6-12 for the Hazus estimated losses by jurisdiction, for residential, commercial, and other occupancy structures.

Table 4.3.6-10. Estimated General Building Stock Exposure to the 1-percent Annual Chance Flood Event

| Jurisdiction | Total Number of Buildings | Total Replacement Cost Value (RCV) | Estimated Building Stock Located in the Flood Hazard Area | | | |
|---|---|---|---|---|---|---|
| | | | Number of Buildings Located in the 1-percent Annual Chance Flood Event Hazard Area | Percent of Total | Total Replacement Cost of Buildings in the 1-percent Annual Chance Flood Event Hazard Area | Percent of Total |
| **Bass River (T)** | 719 | $881,423,037 | 214 | 29.8% | $169,037,202 | 19.2% |
| **Beverly (C)** | 939 | $1,218,790,334 | 11 | 1.2% | $9,354,732 | 0.8% |
| **Bordentown (C)** | 1,041 | $2,794,074,193 | 17 | 1.6% | $90,199,587 | 3.2% |
| **Bordentown (T)** | 3,389 | $5,866,485,431 | 18 | 0.5% | $177,505,555 | 3.0% |
| **Burlington (C)** | 3,165 | $5,813,312,404 | 2,083 | 65.8% | $4,481,395,625 | 77.1% |
| **Burlington (T)** | 6,525 | $8,819,483,894 | 62 | 1.0% | $492,986,877 | 5.6% |
| **Chesterfield (T)** | 2,673 | $2,243,175,804 | 5 | 0.2% | $11,835,419 | 0.5% |
| **Cinnaminson (T)** | 5,833 | $6,206,033,564 | 305 | 5.2% | $416,595,502 | 6.7% |
| **Delanco (T)** | 1,717 | $1,777,428,934 | 86 | 5.0% | $93,509,357 | 5.3% |
| **Delran (T)** | 5,008 | $5,342,639,406 | 162 | 3.2% | $127,588,494 | 2.4% |
| **Eastampton (T)** | 1,947 | $1,223,958,808 | 59 | 3.0% | $28,992,376 | 2.4% |
| **Edgewater Park (T)** | 2,210 | $2,391,677,740 | 2 | 0.1% | $761,508 | 0.0% |
| **Evesham (T)** | 13,368 | $11,128,366,531 | 87 | 0.7% | $109,319,385 | 1.0% |
| **Fieldsboro (B)** | 224 | $241,524,257 | 2 | 0.9% | $763,122 | 0.3% |
| **Florence (T)** | 4,084 | $6,582,323,116 | 17 | 0.4% | $137,080,738 | 2.1% |
| **Hainesport (T)** | 2,546 | $3,283,651,920 | 64 | 2.5% | $74,410,795 | 2.3% |
| **Lumberton (T)** | 3,724 | $4,304,673,748 | 119 | 3.2% | $142,278,141 | 3.3% |
| **Mansfield (T)** | 3,805 | $3,398,330,024 | 8 | 0.2% | $37,805,775 | 1.1% |
| **Maple Shade (T)** | 5,120 | $5,835,178,181 | 30 | 0.6% | $116,303,890 | 2.0% |
| **Medford (T)** | 8,792 | $10,042,226,056 | 116 | 1.3% | $122,325,754 | 1.2% |
| **Medford Lakes (B)** | 1,804 | $967,238,228 | 69 | 3.8% | $40,874,766 | 4.2% |
| **Moorestown (T)** | 7,173 | $12,232,463,125 | 101 | 1.4% | $119,950,840 | 1.0% |
| **Mount Holly (T)** | 2,987 | $3,763,298,318 | 111 | 3.7% | $280,105,073 | 7.4% |
| **Mount Laurel (T)** | 13,150 | $15,418,468,979 | 104 | 0.8% | $220,401,579 | 1.4% |

| Jurisdiction | Total Number of Buildings | Total Replacement Cost Value (RCV) | Estimated Building Stock Located in the Flood Hazard Area | | | |
|---|---|---|---|---|---|---|
| | | | Number of Buildings Located in the 1-percent Annual Chance Flood Event Hazard Area | Percent of Total | Total Replacement Cost of Buildings in the 1-percent Annual Chance Flood Event Hazard Area | Percent of Total |
| **New Hanover (T)** | 1,068 | $2,868,939,587 | 10 | 0.9% | $23,551,593 | 0.8% |
| **North Hanover (T)** | 2,176 | $2,404,670,347 | 12 | 0.6% | $42,065,137 | 1.7% |
| **Palmyra (B)** | 2,482 | $2,133,107,140 | 177 | 7.1% | $345,610,698 | 16.2% |
| **Pemberton (B)** | 519 | $736,141,491 | 2 | 0.4% | $33,848,254 | 4.6% |
| **Pemberton (T)** | 9,729 | $6,973,242,840 | 307 | 3.2% | $256,921,515 | 3.7% |
| **Riverside (T)** | 2,532 | $2,459,954,166 | 171 | 6.8% | $204,957,287 | 8.3% |
| **Riverton (B)** | 989 | $1,096,729,598 | 33 | 3.3% | $64,939,947 | 5.9% |
| **Shamong (T)** | 2,494 | $2,504,926,736 | 37 | 1.5% | $63,932,288 | 2.6% |
| **Southampton (T)** | 5,368 | $4,593,018,255 | 141 | 2.6% | $227,762,051 | 5.0% |
| **Springfield (T)** | 1,826 | $2,140,517,320 | 25 | 1.4% | $59,118,241 | 2.8% |
| **Tabernacle (T)** | 2,938 | $2,200,440,237 | 7 | 0.2% | $12,011,860 | 0.5% |
| **Washington (T)** | 538 | $604,084,949 | 134 | 24.9% | $183,685,861 | 30.4% |
| **Westampton (T)** | 2,795 | $4,620,292,645 | 42 | 1.5% | $72,408,555 | 1.6% |
| **Willingboro (T)** | 10,830 | $8,789,434,159 | 195 | 1.8% | $140,916,806 | 1.6% |
| **Woodland (T)** | 782 | $1,333,495,830 | 18 | 2.3% | $99,904,641 | 7.5% |
| **Wrightstown (B)** | 296 | $748,872,423 | 0 | 0.0% | $0 | 0.0% |
| **Burlington County (Total)** | **149,305** | **$167,984,093,756** | **5,163** | **3.5%** | **$9,333,016,825** | **5.6%** |

*Source: Burlington County, 2023; NJOGIS 2023; Microsoft BING 2022; RS Means 2022; FEMA 2019*

Table 4.3.6-11. Estimated General Building Stock Exposure to the 0.2-percent Annual Chance Flood Event

| Jurisdiction | Total Number of Buildings | Total Replacement Cost Value (RCV) | Estimated Building Stock Located in the Flood Hazard Area | | | |
|---|---|---|---|---|---|---|
| | | | Number of Buildings Located in the 0.2-percent Annual Chance Flood Event Hazard Area | Percent of Total | Total Replacement Cost of Buildings in the 0.2-percent Annual Chance Flood Event Hazard Area | Percent of Total |
| **Bass River (T)** | 719 | $881,423,037 | 353 | 49.1% | $404,896,475 | 45.9% |
| **Beverly (C)** | 939 | $1,218,790,334 | 67 | 7.1% | $37,821,622 | 3.1% |
| **Bordentown (C)** | 1,041 | $2,794,074,193 | 19 | 1.8% | $90,948,803 | 3.3% |
| **Bordentown (T)** | 3,389 | $5,866,485,431 | 24 | 0.7% | $186,865,286 | 3.2% |
| **Burlington (C)** | 3,165 | $5,813,312,404 | 2,524 | 79.7% | $5,431,535,489 | 93.4% |
| **Burlington (T)** | 6,525 | $8,819,483,894 | 291 | 4.5% | $705,722,334 | 8.0% |
| **Chesterfield (T)** | 2,673 | $2,243,175,804 | 5 | 0.2% | $11,835,419 | 0.5% |
| **Cinnaminson (T)** | 5,833 | $6,206,033,564 | 545 | 9.3% | $723,901,218 | 11.7% |
| **Delanco (T)** | 1,717 | $1,777,428,934 | 434 | 25.3% | $300,538,840 | 16.9% |
| **Delran (T)** | 5,008 | $5,342,639,406 | 250 | 5.0% | $229,629,371 | 4.3% |
| **Eastampton (T)** | 1,947 | $1,223,958,808 | 65 | 3.3% | $32,028,160 | 2.6% |
| **Edgewater Park (T)** | 2,210 | $2,391,677,740 | 6 | 0.3% | $4,441,964 | 0.2% |
| **Evesham (T)** | 13,368 | $11,128,366,531 | 114 | 0.9% | $119,457,441 | 1.1% |
| **Fieldsboro (B)** | 224 | $241,524,257 | 2 | 0.9% | $763,122 | 0.3% |
| **Florence (T)** | 4,084 | $6,582,323,116 | 20 | 0.5% | $140,766,260 | 2.1% |
| **Hainesport (T)** | 2,546 | $3,283,651,920 | 73 | 2.9% | $76,386,957 | 2.3% |
| **Lumberton (T)** | 3,724 | $4,304,673,748 | 125 | 3.4% | $144,842,568 | 3.4% |
| **Mansfield (T)** | 3,805 | $3,398,330,024 | 9 | 0.2% | $39,958,635 | 1.2% |
| **Maple Shade (T)** | 5,120 | $5,835,178,181 | 84 | 1.6% | $205,639,749 | 3.5% |
| **Medford (T)** | 8,792 | $10,042,226,056 | 206 | 2.3% | $217,672,351 | 2.2% |
| **Medford Lakes (B)** | 1,804 | $967,238,228 | 74 | 4.1% | $42,403,509 | 4.4% |
| **Moorestown (T)** | 7,173 | $12,232,463,125 | 149 | 2.1% | $247,864,833 | 2.0% |
| **Mount Holly (T)** | 2,987 | $3,763,298,318 | 364 | 12.2% | $983,902,307 | 26.1% |
| **Mount Laurel (T)** | 13,150 | $15,418,468,979 | 449 | 3.4% | $904,801,220 | 5.9% |

| Jurisdiction | Total Number of Buildings | Total Replacement Cost Value (RCV) | Estimated Building Stock Located in the Flood Hazard Area | | | |
|---|---|---|---|---|---|---|
| | | | Number of Buildings Located in the 0.2-percent Annual Chance Flood Event Hazard Area | Percent of Total | Total Replacement Cost of Buildings in the 0.2-percent Annual Chance Flood Event Hazard Area | Percent of Total |
| **New Hanover (T)** | 1,068 | $2,868,939,587 | 10 | 0.9% | $23,551,593 | 0.8% |
| **North Hanover (T)** | 2,176 | $2,404,670,347 | 12 | 0.6% | $42,065,137 | 1.7% |
| **Palmyra (B)** | 2,482 | $2,133,107,140 | 831 | 33.5% | $876,378,465 | 41.1% |
| **Pemberton (B)** | 519 | $736,141,491 | 4 | 0.8% | $34,806,891 | 4.7% |
| **Pemberton (T)** | 9,729 | $6,973,242,840 | 353 | 3.6% | $273,690,194 | 3.9% |
| **Riverside (T)** | 2,532 | $2,459,954,166 | 317 | 12.5% | $295,077,480 | 12.0% |
| **Riverton (B)** | 989 | $1,096,729,598 | 210 | 21.2% | $218,947,608 | 20.0% |
| **Shamong (T)** | 2,494 | $2,504,926,736 | 40 | 1.6% | $65,814,405 | 2.6% |
| **Southampton (T)** | 5,368 | $4,593,018,255 | 156 | 2.9% | $233,263,378 | 5.1% |
| **Springfield (T)** | 1,826 | $2,140,517,320 | 25 | 1.4% | $59,118,241 | 2.8% |
| **Tabernacle (T)** | 2,938 | $2,200,440,237 | 8 | 0.3% | $12,786,740 | 0.6% |
| **Washington (T)** | 538 | $604,084,949 | 217 | 40.3% | $250,408,467 | 41.5% |
| **Westampton (T)** | 2,795 | $4,620,292,645 | 45 | 1.6% | $73,427,467 | 1.6% |
| **Willingboro (T)** | 10,830 | $8,789,434,159 | 240 | 2.2% | $216,700,504 | 2.5% |
| **Woodland (T)** | 782 | $1,333,495,830 | 19 | 2.4% | $100,285,395 | 7.5% |
| **Wrightstown (B)** | 296 | $748,872,423 | 0 | 0.0% | $0 | 0.0% |
| **Burlington County (Total)** | **149,305** | **$167,984,093,756** | **8,739** | **5.9%** | **$14,060,945,896** | **8.4%** |

*Source: Burlington County, 2023; NJOGIS 2023; Microsoft BING 2022; RS Means 2022; FEMA 2019*

## Table 4.3.6-12. Estimated Building Stock Potential Loss by Occupancy to the 1-percent Annual Chance Flood Event

| Jurisdiction | Total Replacement Cost Value (RCV) | Estimated Loss for All Occupancies | Estimated Loss for Residential Properties | Estimated Loss for Commercial Properties | Estimated Loss for All Other Occupancies |
|---|---|---|---|---|---|
| **Bass River (T)** | $881,423,037 | $46,432,708 | $27,562,235 | $7,630,261 | $11,240,212 |
| **Beverly (C)** | $1,218,790,333 | $687,688 | $112,203 | $575,485 | $0 |
| **Bordentown (C)** | $2,794,074,193 | $31,133,684 | $1,227,469 | $28,904,424 | $1,001,791 |
| **Bordentown (T)** | $5,866,485,430 | $62,567,059 | $915,491 | $57,168,374 | $4,483,195 |
| **Burlington (C)** | $5,813,312,405 | $1,075,964,126 | $245,485,834 | $706,759,175 | $123,719,117 |
| **Burlington (T)** | $8,819,483,895 | $85,526,649 | $3,038,464 | $14,333,958 | $68,154,228 |
| **Chesterfield (T)** | $2,243,175,804 | $5,566,919 | $281,586 | $0 | $5,285,333 |
| **Cinnaminson (T)** | $6,206,033,564 | $106,732,947 | $25,898,200 | $63,463,389 | $17,371,358 |
| **Delanco (T)** | $1,777,428,934 | $20,706,329 | $5,970,187 | $13,751,513 | $984,628 |
| **Delran (T)** | $5,342,639,406 | $21,959,018 | $11,294,844 | $10,577,115 | $87,059 |
| **Eastampton (T)** | $1,223,958,808 | $6,059,035 | $4,850,365 | $1,094,075 | $114,594 |
| **Edgewater Park (T)** | $2,391,677,740 | $351,044 | $351,044 | $0 | $0 |
| **Evesham (T)** | $11,128,366,531 | $16,841,660 | $2,929,604 | $12,429,109 | $1,482,946 |
| **Fieldsboro (B)** | $241,524,257 | $270,286 | $225,791 | $0 | $44,495 |
| **Florence (T)** | $6,582,323,116 | $28,330,303 | $913,284 | $25,683,391 | $1,733,628 |
| **Hainesport (T)** | $3,283,651,920 | $24,288,107 | $4,671,896 | $19,616,211 | $0 |
| **Lumberton (T)** | $4,304,673,748 | $28,279,966 | $15,919,770 | $2,261,347 | $10,098,849 |
| **Mansfield (T)** | $3,398,330,024 | $886,705 | $214,831 | $665,292 | $6,581 |
| **Maple Shade (T)** | $5,835,178,181 | $10,587,928 | $1,576,484 | $5,989,482 | $3,021,962 |
| **Medford (T)** | $10,042,226,056 | $19,540,088 | $4,942,831 | $10,139,806 | $4,457,451 |
| **Medford Lakes (B)** | $967,238,228 | $2,523,039 | $2,514,550 | $0 | $8,488 |
| **Moorestown (T)** | $12,232,463,125 | $24,688,779 | $5,745,110 | $18,943,669 | $0 |
| **Mount Holly (T)** | $3,763,298,318 | $38,106,327 | $5,078,895 | $32,977,975 | $49,458 |
| **Mount Laurel (T)** | $15,418,468,979 | $47,411,773 | $2,929,281 | $35,492,442 | $8,990,050 |
| **New Hanover (T)** | $2,868,939,587 | $1,389,607 | $885,854 | $0 | $503,753 |
| **North Hanover (T)** | $2,404,670,347 | $1,179,050 | $1,066,769 | $112,282 | $0 |
| **Palmyra (B)** | $2,133,107,140 | $31,551,933 | $6,384,318 | $16,962,679 | $8,204,937 |
| **Pemberton (B)** | $736,141,491 | $38,682 | $38,682 | $0 | $0 |
| **Pemberton (T)** | $6,973,242,839 | $25,568,191 | $12,069,874 | $9,189,474 | $4,308,843 |
| **Riverside (T)** | $2,459,954,166 | $31,235,853 | $6,062,187 | $21,337,023 | $3,836,643 |
| **Riverton (B)** | $1,096,729,598 | $26,804,248 | $1,404,324 | $22,643,918 | $2,756,006 |
| **Shamong (T)** | $2,504,926,736 | $3,641,828 | $1,607,936 | $274,063 | $1,759,829 |
| **Southampton (T)** | $4,593,018,255 | $11,974,585 | $8,055,682 | $70,850 | $3,848,053 |
| **Springfield (T)** | $2,140,517,320 | $3,920,458 | $580,771 | $2,781,494 | $558,192 |
| **Tabernacle (T)** | $2,200,440,237 | $341,229 | $275,795 | $0 | $65,434 |

| Jurisdiction | Total Replacement Cost Value (RCV) | Estimated Loss for All Occupancies | Estimated Loss for Residential Properties | Estimated Loss for Commercial Properties | Estimated Loss for All Other Occupancies |
|---|---|---|---|---|---|
| **Washington (T)** | $604,084,949 | $41,178,112 | $10,479,180 | $16,898,948 | $13,799,984 |
| **Westampton (T)** | $4,620,292,645 | $2,529,389 | $1,811,269 | $193,039 | $525,080 |
| **Willingboro (T)** | $8,789,434,159 | $24,504,420 | $14,787,428 | $9,580,291 | $136,701 |
| **Woodland (T)** | $1,333,495,831 | $8,189,383 | $197,129 | $0 | $7,992,254 |
| **Wrightstown (B)** | $748,872,423 | $0 | $0 | $0 | $0 |
| **Burlington County (Total)** | **$167,984,093,755** | **$1,919,489,133** | **$440,357,445** | **$1,168,500,554** | **$310,631,134** |

*Source: Hazus v6.0*

There are an estimated 90 buildings in the Sea Level Rise 1-foot Hazard Area, representing approximately 0.3-percent of the County's total general building stock inventory replacement cost value. The Township of Cinnaminson has the greatest number of its buildings located in the Sea Level Rise 1-foot Hazard Area (16 buildings or 0.3-percent of its total building stock). There are an estimated 272 buildings in the Sea Level Rise 3-foot Hazard Area, representing approximately 0.5-percent of the County's total general building stock inventory replacement cost value. The Township of Cinnaminson also has the greatest number of its buildings located in the Sea Level Rise 3-foot Hazard Area (88 buildings or 1.5 percent of its total building stock). Refer to Table 4.3.6-13 and Table 4.3.6-14 for the estimated exposure of Sea Level Rise 1-foot Hazard Area and Sea Level Rise 3-foot Hazard Area by jurisdiction.

### Table 4.3.6-13. Estimated General Building Stock Exposure to the Sea Level Rise 1-foot Hazard Area

| Jurisdiction | Total Number of Buildings | Total Replacement Cost Value (RCV) | Estimated Number and Total Replacement Cost Value of Structures Located in the Sea Level Rise 1-foot Hazard Area | | | |
|---|---|---|---|---|---|---|
| | | | Number of Buildings | Percent of Total | Total Replacement Cost Value of Buildings | Percent of Total |
| **Bass River (T)** | 719 | $881,423,037 | 11 | 1.5% | $24,002,658 | 2.7% |
| **Beverly (C)** | 939 | $1,218,790,334 | 0 | 0.0% | $0 | 0.0% |
| **Bordentown (C)** | 1,041 | $2,794,074,193 | 1 | 0.1% | $404,984 | <0.1% |
| **Bordentown (T)** | 3,389 | $5,866,485,431 | 8 | 0.2% | $147,092,038 | 2.5% |
| **Burlington (C)** | 3,165 | $5,813,312,404 | 4 | 0.1% | $2,783,834 | <0.1% |
| **Burlington (T)** | 6,525 | $8,819,483,894 | 1 | <0.1% | $12,604,725 | 0.1% |
| **Chesterfield (T)** | 2,673 | $2,243,175,804 | 2 | 0.1% | $809,968 | <0.1% |
| **Cinnaminson (T)** | 5,833 | $6,206,033,564 | 16 | 0.3% | $87,642,491 | 1.4% |
| **Delanco (T)** | 1,717 | $1,777,428,934 | 2 | 0.1% | $687,849 | <0.1% |
| **Delran (T)** | 5,008 | $5,342,639,406 | 0 | 0.0% | $0 | 0.0% |
| **Eastampton (T)** | 1,947 | $1,223,958,808 | 0 | 0.0% | $0 | 0.0% |
| **Edgewater Park (T)** | 2,210 | $2,391,677,740 | 1 | <0.1% | $380,754 | <0.1% |
| **Evesham (T)** | 13,368 | $11,128,366,531 | 0 | 0.0% | $0 | 0.0% |
| **Fieldsboro (B)** | 224 | $241,524,257 | 1 | 0.4% | $280,249 | 0.1% |
| **Florence (T)** | 4,084 | $6,582,323,116 | 0 | 0.0% | $0 | 0.0% |
| **Hainesport (T)** | 2,546 | $3,283,651,920 | 4 | 0.2% | $35,574,242 | 1.1% |

| Jurisdiction | Total Number of Buildings | Total Replacement Cost Value (RCV) | Estimated Number and Total Replacement Cost Value of Structures Located in the Sea Level Rise 1-foot Hazard Area | | | |
|---|---|---|---|---|---|---|
| | | | Number of Buildings | Percent of Total | Total Replacement Cost Value of Buildings | Percent of Total |
| **Lumberton (T)** | 3,724 | $4,304,673,748 | 8 | 0.2% | $3,142,943 | 0.1% |
| **Mansfield (T)** | 3,805 | $3,398,330,024 | 0 | 0.0% | $0 | 0.0% |
| **Maple Shade (T)** | 5,120 | $5,835,178,181 | 2 | <0.1% | $785,738 | <0.1% |
| **Medford (T)** | 8,792 | $10,042,226,056 | 0 | 0.0% | $0 | 0.0% |
| **Medford Lakes (B)** | 1,804 | $967,238,228 | 0 | 0.0% | $0 | 0.0% |
| **Moorestown (T)** | 7,173 | $12,232,463,125 | 10 | 0.1% | $37,900,465 | 0.3% |
| **Mount Holly (T)** | 2,987 | $3,763,298,318 | 1 | <0.1% | $34,431,980 | 0.9% |
| **Mount Laurel (T)** | 13,150 | $15,418,468,979 | 0 | 0.0% | $0 | 0.0% |
| **New Hanover (T)** | 1,068 | $2,868,939,587 | 0 | 0.0% | $0 | 0.0% |
| **North Hanover (T)** | 2,176 | $2,404,670,347 | 0 | 0.0% | $0 | 0.0% |
| **Palmyra (B)** | 2,482 | $2,133,107,140 | 3 | 0.1% | $648,819 | <0.1% |
| **Pemberton (B)** | 519 | $736,141,491 | 0 | 0.0% | $0 | 0.0% |
| **Pemberton (T)** | 9,729 | $6,973,242,840 | 0 | 0.0% | $0 | 0.0% |
| **Riverside (T)** | 2,532 | $2,459,954,166 | 0 | 0.0% | $0 | 0.0% |
| **Riverton (B)** | 989 | $1,096,729,598 | 2 | 0.2% | $34,826,634 | 3.2% |
| **Shamong (T)** | 2,494 | $2,504,926,736 | 0 | 0.0% | $0 | 0.0% |
| **Southampton (T)** | 5,368 | $4,593,018,255 | 0 | 0.0% | $0 | 0.0% |
| **Springfield (T)** | 1,826 | $2,140,517,320 | 1 | 0.1% | $237,617 | <0.1% |
| **Tabernacle (T)** | 2,938 | $2,200,440,237 | 0 | 0.0% | $0 | 0.0% |
| **Washington (T)** | 538 | $604,084,949 | 10 | 1.9% | $4,112,143 | 0.7% |
| **Westampton (T)** | 2,795 | $4,620,292,645 | 0 | 0.0% | $0 | 0.0% |
| **Willingboro (T)** | 10,830 | $8,789,434,159 | 2 | <0.1% | $761,508 | <0.1% |
| **Woodland (T)** | 782 | $1,333,495,830 | 0 | 0.0% | $0 | 0.0% |
| **Wrightstown (B)** | 296 | $748,872,423 | 0 | 0.0% | $0 | 0.0% |
| **Burlington County Total** | **149,305** | **$167,984,093,756** | **90** | **0.1%** | **$429,111,637** | **0.3%** |

*Source: Burlington County, 2023; NJOGIS 2023; Microsoft BING 2022; RS Means 2022; NOAA 2022*

### Table 4.3.6-14. Estimated General Building Stock Exposure to the Sea Level Rise 3-foot Hazard Area

| Jurisdiction | Total Number of Buildings | Total Replacement Cost Value (RCV) | Estimated Number and Total Replacement Cost Value of Structures Located in the Sea Level Rise 3-foot Hazard Area | | | |
|---|---|---|---|---|---|---|
| | | | Number of Buildings | Percent of Total | Total Replacement Cost Value of Buildings | Percent of Total |
| **Bass River (T)** | 719 | $881,423,037 | 26 | 3.6% | $30,119,786 | 3.4% |
| **Beverly (C)** | 939 | $1,218,790,334 | 0 | 0.0% | $0 | 0.0% |
| **Bordentown (C)** | 1,041 | $2,794,074,193 | 4 | 0.4% | $41,924,842 | 1.5% |
| **Bordentown (T)** | 3,389 | $5,866,485,431 | 9 | 0.3% | $147,497,021 | 2.5% |
| **Burlington (C)** | 3,165 | $5,813,312,404 | 7 | 0.2% | $4,528,121 | 0.1% |
| **Burlington (T)** | 6,525 | $8,819,483,894 | 2 | <0.1% | $15,167,805 | 0.2% |
| **Chesterfield (T)** | 2,673 | $2,243,175,804 | 2 | 0.1% | $809,968 | <0.1% |

| Jurisdiction | Total Number of Buildings | Total Replacement Cost Value (RCV) | Estimated Number and Total Replacement Cost Value of Structures Located in the Sea Level Rise 3-foot Hazard Area | | | |
|---|---|---|---|---|---|---|
| | | | Number of Buildings | Percent of Total | Total Replacement Cost Value of Buildings | Percent of Total |
| **Cinnaminson (T)** | 5,833 | $6,206,033,564 | 88 | 1.5% | $234,090,087 | 3.8% |
| **Delanco (T)** | 1,717 | $1,777,428,934 | 6 | 0.3% | $36,584,133 | 2.1% |
| **Delran (T)** | 5,008 | $5,342,639,406 | 30 | 0.6% | $33,053,271 | 0.6% |
| **Eastampton (T)** | 1,947 | $1,223,958,808 | 0 | 0.0% | $0 | 0.0% |
| **Edgewater Park (T)** | 2,210 | $2,391,677,740 | 1 | <0.1% | $380,754 | <0.1% |
| **Evesham (T)** | 13,368 | $11,128,366,531 | 0 | 0.0% | $0 | 0.0% |
| **Fieldsboro (B)** | 224 | $241,524,257 | 1 | 0.4% | $280,249 | 0.1% |
| **Florence (T)** | 4,084 | $6,582,323,116 | 0 | 0.0% | $0 | 0.0% |
| **Hainesport (T)** | 2,546 | $3,283,651,920 | 6 | 0.2% | $36,191,236 | 1.1% |
| **Lumberton (T)** | 3,724 | $4,304,673,748 | 15 | 0.4% | $5,720,382 | 0.1% |
| **Mansfield (T)** | 3,805 | $3,398,330,024 | 0 | 0.0% | $0 | 0.0% |
| **Maple Shade (T)** | 5,120 | $5,835,178,181 | 3 | 0.1% | $12,885,638 | 0.2% |
| **Medford (T)** | 8,792 | $10,042,226,056 | 0 | 0.0% | $0 | 0.0% |
| **Medford Lakes (B)** | 1,804 | $967,238,228 | 0 | 0.0% | $0 | 0.0% |
| **Moorestown (T)** | 7,173 | $12,232,463,125 | 11 | 0.2% | $38,281,219 | 0.3% |
| **Mount Holly (T)** | 2,987 | $3,763,298,318 | 3 | 0.1% | $35,651,462 | 0.9% |
| **Mount Laurel (T)** | 13,150 | $15,418,468,979 | 1 | <0.1% | $207,451 | <0.1% |
| **New Hanover (T)** | 1,068 | $2,868,939,587 | 0 | 0.0% | $0 | 0.0% |
| **North Hanover (T)** | 2,176 | $2,404,670,347 | 0 | 0.0% | $0 | 0.0% |
| **Palmyra (B)** | 2,482 | $2,133,107,140 | 5 | 0.2% | $793,061 | <0.1% |
| **Pemberton (B)** | 519 | $736,141,491 | 0 | 0.0% | $0 | 0.0% |
| **Pemberton (T)** | 9,729 | $6,973,242,840 | 0 | 0.0% | $0 | 0.0% |
| **Riverside (T)** | 2,532 | $2,459,954,166 | 8 | 0.3% | $40,654,305 | 1.7% |
| **Riverton (B)** | 989 | $1,096,729,598 | 3 | 0.3% | $48,916,604 | 4.5% |
| **Shamong (T)** | 2,494 | $2,504,926,736 | 0 | 0.0% | $0 | 0.0% |
| **Southampton (T)** | 5,368 | $4,593,018,255 | 0 | 0.0% | $0 | 0.0% |
| **Springfield (T)** | 1,826 | $2,140,517,320 | 1 | 0.1% | $237,617 | <0.1% |
| **Tabernacle (T)** | 2,938 | $2,200,440,237 | 0 | 0.0% | $0 | 0.0% |
| **Washington (T)** | 538 | $604,084,949 | 26 | 4.8% | $72,114,906 | 11.9% |
| **Westampton (T)** | 2,795 | $4,620,292,645 | 6 | 0.2% | $1,622,162 | <0.1% |
| **Willingboro (T)** | 10,830 | $8,789,434,159 | 8 | 0.1% | $2,807,776 | <0.1% |
| **Woodland (T)** | 782 | $1,333,495,830 | 0 | 0.0% | $0 | 0.0% |
| **Wrightstown (B)** | 296 | $748,872,423 | 0 | 0.0% | $0 | 0.0% |
| **Burlington County Total** | **149,305** | **$167,984,093,756** | **272** | **0.2%** | **$840,519,856** | **0.5%** |

*Source: Burlington County, 2023; NJOGIS 2023; Microsoft BING 2022; RS Means 2022; NOAA 2022*

### NFIP Statistics

In addition to total building stock modeling, individual data available on flood policies, claims, and repetitive loss (RL) properties were analyzed. FEMA Region 2 provided a list of residential properties with NFIP policies, past claims, and multiple claims (RLs). According to the metadata provided, "The (*sic* National Flood Insurance Program) NFIP Repetitive Loss File contains losses reported from individuals who have flood insurance through the Federal Government. A property is considered a repetitive loss property when there are two or more losses reported that were paid more than $1,000 for each loss. The two losses must be within 10 years of each other & be as least 10 days apart. Only losses from (*sic* since) 1/1/1978 that are closed are considered."

Counts of SRLs were not available for review during this planning process for Burlington County. According to Section 1361A of the National Flood Insurance Act, as amended (NFIA), 42 *United States Code* (U.S.C.) 4102a, an SRL property is defined as a residential property covered under an NFIP flood insurance policy, and satisfying either of conditions 1 and 2, as well as condition 3:

1. At least four NFIP claim payments for the property (including building and contents) over $5,000 each have occurred, and the cumulative amount of such claim payments exceeded $20,000.
2. At least two separate claims payments for the property (building payments only) have occurred, and the cumulative amount of the building portion of such claims exceeded the market value of the building.
3. For either of the above, at least two of the referenced claims must have occurred within any 10-year period and must have occurred more than 10 days apart.

Table 4.3.6-15 summarizes NFIP policies, claims, and repetitive loss statistics for Burlington County. Locations of the properties with policies, claims, and repetitive and severe repetitive flooding were geocoded by FEMA with the understanding that differences (and variations in those differences) were possible between listed longitude and latitude coordinates of properties and actual locations of property addresses—namely, that indications of some locations were more accurate than others.

**Table 4.3.6-15. NFIP Policies, Claims, and Repetitive Loss Statistics**

| Jurisdiction | Total Number of Policies | Total Claims | Total Payments | Number of NFIP Repetitive Loss (RL) Properties |
|---|---|---|---|---|
| Bass River (T) | 31 | 46 | $1,248,920.15 | 4 |
| Beverly (C) | 4 | 1 | $3,513.71 | 0 |
| Bordentown (C) | 3 | 8 | $32,407.54 | 2 |
| Bordentown (T) | 17 | 9 | $7,285.60 | 1 |
| Burlington (C) | 736 | 276 | $687,096.10 | 14 |
| Burlington (T) | 68 | 40 | $270,825.50 | 2 |
| Chesterfield (T) | 6 | 3 | $2,128.40 | 0 |
| Cinnaminson (T) | 169 | 168 | $1,350,712.09 | 18 |
| Delanco (T) | 76 | 22 | $138,143.76 | 2 |
| Delran (T) | 78 | 99 | $631,897.45 | 12 |
| Eastampton (T) | 17 | 97 | $871,378.78 | 15 |
| Edgewater Park (T) | 6 | 5 | $16,200.85 | 0 |
| Evesham (T) | 106 | 37 | $234,570.92 | 4 |
| Fieldsboro (B) | 0 | 0 | $0.00 | 0 |
| Florence (T) | 12 | 5 | $27,929.03 | 0 |

| Jurisdiction | Total Number of Policies | Total Claims | Total Payments | Number of NFIP Repetitive Loss (RL) Properties |
|---|---|---|---|---|
| Hainesport (T) | 14 | 5 | $11,782.21 | 0 |
| Lumberton (T) | 51 | 206 | $7,179,248.51 | 42 |
| Mansfield (T) | 11 | 5 | $9,489.05 | 0 |
| Maple Shade (T) | 21 | 8 | $260,619.32 | 1 |
| Medford (T) | 51 | 31 | $294,197.27 | 3 |
| Medford Lakes (B) | 164 | 205 | $3,726,738.86 | 13 |
| Moorestown (T) | 93 | 55 | $250,625.01 | 4 |
| Mount Holly (T) | 52 | 121 | $2,093,593.00 | 16 |
| Mount Laurel (T) | 158 | 82 | $516,765.02 | 5 |
| New Hanover (T) | 0 | 5 | $889.34 | 0 |
| North Hanover (T) | 6 | 1 | $13,060.31 | 0 |
| Palmyra (B) | 132 | 44 | $235,083.95 | 4 |
| Pemberton (B) | 1 | 5 | $3,995.73 | 0 |
| Pemberton (T) | 129 | 117 | $1,449,323.99 | 13 |
| Riverside (T) | 40 | 53 | $532,674.79 | 4 |
| Riverton (B) | 25 | 3 | $3,527.46 | 0 |
| Shamong (T) | 13 | 7 | $8,926.85 | 1 |
| Southampton (T) | 50 | 156 | $3,218,832.22 | 29 |
| Springfield (T) | 5 | 3 | $21,515.74 | 0 |
| Tabernacle (T) | 9 | 1 | $6,406.91 | 0 |
| Washington (T) | 28 | 22 | $1,133,647.60 | 2 |
| Westampton (T) | 26 | 21 | $219,627.09 | 4 |
| Willingboro (T) | 133 | 34 | $721,475.65 | 2 |
| Woodland (T) | 1 | 0 | $0.00 | 0 |
| Wrightstown (B) | 1 | 2 | $15,631.58 | 0 |
| **Burlington County (Total)** | **2,543** | **2,008** | **$27,450,687** | **217** |

*Source: NFIP 2023*
*Notes: Data current as of October 2023*
*RL NFIP Definition Any insurable building for which two or more claims of more than $1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling ten-year period, since 1978.*

## Impact on Critical Facilities

It is important to determine the critical facilities and infrastructure within the County that may be at risk to flooding and who may be impacted should damage occur. Critical services during and after a flood event may not be available if critical facilities are directly damaged or transportation routes to access these critical facilities are impacted. Roads that are blocked or damaged can isolate residents and can prevent access throughout the planning area to many service providers needing to get to vulnerable populations or to make repairs. Utilities such as overhead power, cable, and phone lines could also be vulnerable due to utility poles damaged by standing water or the surge of water from a dam failure event. Loss of these utilities could create additional isolation issues for the inundation zones (refer to Section 4.3.1 Dam Failure).

Major roadways that may be impacted by the 1-percent annual chance flood event include Interstates Route-130, Route-73, Route-38, the Garden State Parkway, New Jersey Turnpike, Route-206, and other various state and county roads. There are several issues associated with transportation routes flooding, including isolation caused by bridges being washed out or blocked by floods or debris, health problems caused by water and sewer systems that are flooded or backed up, drinking water contamination caused by floodwaters carrying pollutants in water supplies, and localized urban flooding caused by culverts blocked with debris.

Community lifeline exposure to the 1-percent and 0.2-percent annual chance flood hazard event boundary was examined. In addition, Hazus was used to estimate the flood loss potential to community lifelines located in the FEMA mapped floodplains. Table 4.3.6-16 summarizes the number of community lifelines exposed to the 1-percent and 0.2-percent flood inundation areas by jurisdiction. Of the 283 community lifelines located in the 1-percent annual chance flood event boundary, Safety and Security has the majority of facilities (212). Out of the 340 community lifelines located in the 0.2-percent annual chance flood event boundary, Safety and Security has the majority of facilities (238). Refer to Section 3 (County Profile) for more information about the critical facilities and lifelines in Burlington County.

**Table 4.3.6-16. Number of Lifeline Critical Facilities Located in the Annual Chance Flood Hazard Area**

| FEMA Lifeline Category | Number of Lifelines | Number of Lifelines Located in the 1-percent Annual Chance Flood Event Hazard Area | Number of Lifelines Located in the 0.2-percent Annual Chance Flood Event Hazard Area |
|---|---|---|---|
| **Communications** | 2 | 0 | 0 |
| **Energy** | 31 | 3 | 4 |
| **Food, Hydration, Shelter** | 189 | 6 | 11 |
| **Hazardous Materials** | 207 | 29 | 48 |
| **Health and Medical** | 113 | 5 | 6 |
| **Safety and Security** | 1,101 | 212 | 238 |
| **Transportation** | 53 | 16 | 17 |
| **Water Systems** | 119 | 12 | 16 |
| **Burlington County (Total)** | **1,813** | **283** | **340** |

*Source: Burlington County, 2023; FEMA 2019*

Table 4.3.6-17 summarizes the number of community lifelines exposed to the Sea Level Rise 1-foot and 3-Foot Hazard Areas by jurisdiction. Of the 11 community lifelines located in the Sea Level Rise 1-foot Hazard Area, Safety and Security and Transportation have the majority of facilities (4 each). Out of the 18 community lifelines located in the Sea Level Rise 3-foot Hazard Area, Safety and Security, Transportation and Hazardous Materials have the same number of facilities (6 each). Refer to Section 3 (County Profile) for more information about the critical facilities and lifelines in Burlington County.

### Table 4.3.6-17. Number of Critical Facilities Located in the Sea Level Rise 1-foot and 3-Foot Hazard Areas

| FEMA Lifeline Category | Number of Lifelines | Number of Lifelines Located in the Sea Level Rise 1-foot Hazard Area | Number of Lifelines Located in the Sea Level Rise 3-foot Hazard Area |
|---|---|---|---|
| **Communications** | 2 | 0 | 0 |
| **Energy** | 31 | 0 | 0 |
| **Food, Hydration, Shelter** | 189 | 0 | 0 |
| **Hazardous Materials** | 207 | 3 | 6 |
| **Health and Medical** | 113 | 0 | 0 |
| **Safety and Security** | 1,101 | 4 | 6 |
| **Transportation** | 53 | 4 | 6 |
| **Water Systems** | 119 | 0 | 0 |
| **Burlington County (Total)** | **1,813** | **11** | **18** |

*Source: Burlington County, 2023; FEMA 2019*

## Impact on Economy

Flood events can significantly impact the local and regional economy. This includes but is not limited to general building stock damages and associated tax loss, impacts on utilities and infrastructure, business interruption, and impacts on tourism; view Table 4.3.6-18 below which discusses building-related economic losses due to the 1-percent annual chance flood event. In areas that are directly flooded, renovations of commercial and industrial buildings may be necessary, disrupting associated services. The Impact on General Building Stock subsection above discusses replacement cost value for buildings located in flood zones.

### Table 4.3.6-18. Building-Related Economic Loss Estimates from the 1-percent Annual Chance Flood Event

| | Building-Related Economic Loss Estimates | | | | |
|---|---|---|---|---|---|
| **Flood Hazard** | **Inventory Loss** | **Relocation Loss** | **Wage Loss** | **Rental Loss** | **Income Loss** |
| **1-Percent Annual Chance Flood Event** | $502,150,000 | $371,570,000 | $832,000,000 | $201,200,000 | $1,987,000,000 |

*Source: Hazus v6.0*

Debris management may also be a large expense after a flood event. HAZUS estimates the amount of structural debris generated during a flood event. The model breaks down debris into three categories: (1) finishes (dry wall, insulation, etc.); (2) structural (wood, brick, etc.); and (3) foundations (concrete slab and block, rebar, etc.). These distinctions are necessary because of the different types of equipment needed to handle debris. Table 4.3.6-19 summarizes the Hazus v6 countywide debris estimates for the 1-percent annual chance flood event. This table only estimates structural debris generated by flooding and does not include non-structural debris or additional potential damage and debris possibly generated by wind that may be associated with a flood event or storm that causes flooding. Overall, Hazus estimates that there will be 28,176 tons of debris generated during the 1-percent annual chance flood event in Burlington County.

### Table 4.3.6-19. Estimated Debris Generated from the 1-percent Annual Chance Flood Event

| Jurisdiction | 1-Percent Annual Chance Flood Event | | | |
|---|---|---|---|---|
| | Total (tons) | Finish (tons) | Structure (tons) | Foundation (tons) |
| **Bass River (T)** | 1,232 | 1,024 | 130 | 78 |
| **Beverly (C)** | 40 | 40 | 0 | 0 |
| **Bordentown (C)** | 137 | 87 | 30 | 20 |
| **Bordentown (T)** | 494 | 177 | 193 | 124 |
| **Burlington (C)** | 18,102 | 16,017 | 1,322 | 764 |
| **Burlington (T)** | 194 | 175 | 11 | 7 |
| **Chesterfield (T)** | 28 | 9 | 11 | 8 |
| **Cinnaminson (T)** | 1,138 | 1,099 | 24 | 15 |
| **Delanco (T)** | 396 | 236 | 104 | 56 |
| **Delran (T)** | 783 | 621 | 103 | 59 |
| **Eastampton (T)** | 22 | 17 | 2 | 4 |
| **Edgewater Park (T)** | 2 | 2 | 0 | 0 |
| **Evesham (T)** | 74 | 73 | 1 | 0 |
| **Fieldsboro (B)** | 43 | 18 | 14 | 11 |
| **Florence (T)** | 338 | 103 | 139 | 96 |
| **Hainesport (T)** | 227 | 170 | 35 | 21 |
| **Lumberton (T)** | 182 | 141 | 24 | 17 |
| **Mansfield (T)** | 54 | 26 | 17 | 10 |
| **Maple Shade (T)** | 189 | 186 | 2 | 1 |
| **Medford (T)** | 229 | 227 | 1 | 1 |
| **Medford Lakes (B)** | 128 | 128 | 0 | 0 |
| **Moorestown (T)** | 240 | 239 | 0 | 0 |
| **Mount Holly (T)** | 1,288 | 1,288 | 0 | 0 |
| **Mount Laurel (T)** | 151 | 144 | 4 | 3 |
| **New Hanover (T)** | 6 | 5 | 0 | 0 |
| **North Hanover (T)** | 58 | 35 | 14 | 9 |
| **Palmyra (B)** | 238 | 236 | 1 | 1 |
| **Pemberton (B)** | 23 | 23 | 0 | 0 |
| **Pemberton (T)** | 332 | 318 | 7 | 7 |
| **Riverside (T)** | 358 | 349 | 5 | 3 |
| **Riverton (B)** | 112 | 98 | 8 | 5 |
| **Shamong (T)** | 17 | 13 | 1 | 3 |
| **Southampton (T)** | 164 | 163 | 0 | 0 |
| **Springfield (T)** | 33 | 28 | 3 | 2 |
| **Tabernacle (T)** | 3 | 3 | 0 | 0 |

| Jurisdiction | 1-Percent Annual Chance Flood Event | | | |
|---|---|---|---|---|
| | Total (tons) | Finish (tons) | Structure (tons) | Foundation (tons) |
| **Washington (T)** | 162 | 160 | 2 | 1 |
| **Westampton (T)** | 34 | 34 | 0 | 0 |
| **Willingboro (T)** | 904 | 774 | 79 | 51 |
| **Woodland (T)** | 2 | 2 | 0 | 0 |
| **Wrightstown (B)** | 20 | 12 | 5 | 3 |
| **Burlington County (Total)** | **28,176** | **24,503** | **2,293** | **1,380** |

*Source: Hazus v6.0*

### Impact on Environment

As Burlington County and its jurisdictions evolve with changes in population and density, flood events may increase in frequency and/or severity as land use changes, more structures are built, and impervious surfaces expand. Furthermore, flood extents for the 1-percent annual chance flood event will continue to evolve alongside natural occurrences such as climate change and/or severe weather events. These flood events will inevitably impact Burlington County's natural and local environment.

The environmental impacts of a flood can include significant water quality and debris-disposal issues. Flood waters can back up sanitary sewer systems and inundate wastewater treatment plants, causing raw sewage to contaminate residential and commercial buildings and the flooded waterway. The contents of unsecured containers of oil, fertilizers, pesticides, and other chemicals get added to flood waters. Hazardous materials may be released and distributed widely across the floodplain. Water supply and wastewater treatment facilities could be offline for weeks. After the flood waters subside, contaminated and flood-damaged building materials and contents must be properly disposed of. Contaminated sediment must be removed from buildings, yards, and properties. In addition, severe erosion is likely; such erosion can negatively impact local ecosystems.

### Cascading Impacts on Other Hazards

#### Public Health

Cascading impacts may also include exposure to pathogens such as mold. After flood events, excess moisture and standing water contribute to the growth of mold in buildings. Mold may present a health risk to building occupants, especially those with already compromised immune systems such as infants, children, the elderly and pregnant women. The degree of impact will vary and is not strictly measurable. Mold spores can grow in as short a period as 24-48 hours in wet and damaged areas of buildings that have not been properly cleaned. Very small mold spores can easily be inhaled, creating the potential for allergic reactions, asthma episodes, and other respiratory problems. Buildings should be properly cleaned and dried out to safely prevent mold growth (CDC 2020).

Molds and mildews are not the only public health risk associated with flooding. Floodwaters can be contaminated by pollutants such as sewage, human and animal feces, pesticides, fertilizers, oil, asbestos, and rusting building materials. Common public health risks associated with flood events also include (FEMA 2022):

- Unsafe food
- Contaminated drinking and washing water and poor sanitation
- Mosquitos and animals
- Carbon monoxide poisoning
- Secondary hazards associated with re-entering/cleaning flooded structures
- Mental stress and fatigue

Current loss estimation models such as Hazus are not equipped to measure public health impacts. The best level of mitigation for these impacts is to be aware that they can occur, educate the public on prevention, and be prepared to deal with these vulnerabilities in responding to flood events.

### Utility Disruption

Floods of any type have the potential to impact water and power utilities which may impact public and private use, as well as cause disruption to critical infrastructure. Refer to the list below to view flooding's harmful effects on the water supply (Andrew 2021):

- Water Supply Contamination: Excess floodwater can contaminate private drinking water sources, such as wells and springs. Floodwater picks up debris, increasing the number of bacteria, sewage, and other industrial waste and chemicals into the water source or leaky pipes. Excess water also makes it more difficult for water treatment plants to treat the water efficiently and effectively. If there is a contamination at any step of the water flow process, this puts consumers at risk of exposure to dangerous toxins that could result in serious harm, such as wound infections, skin rashes, gastrointestinal illnesses, and tetanus; in extreme cases, death may occur.
- Disruption to Clean Drinking and Cooking Water: In the event of only having access to contaminated water, consumers are unable to cook or clean in their home the water is certified as safe. Depending on the severity of the flood and the storm, this could take days, weeks, months and in some cases even years. Without access to clean drinking and cooking water, consumers ultimately become reliant on bottled water. In impoverished communities, this reality is even more detrimental because those affected may not have the economic means to "stock up" on bottled water. Moreover, in a flood, retail locations are often inaccessible and/or low on water supply.

Floodwaters can also cause damage to power utilities. In particular, flooded buildings may have the utilities disrupted if the service panel, generator, meter, etc. are not elevated above the flood protection level. Oversaturated soils from periods of heavy rain and flooding may cause utility poles to tip over or fall completely, interrupting the power grid for a potentially large area, especially if the transformer is impacted.

### Further Changes that May Impact Vulnerability

Understanding future changes that may impact vulnerability in the County can assist in planning for future development and ensuring that appropriate mitigation, planning, and preparedness measures are in place. The County considered the following factors that may affect hazard vulnerability:

- Potential or projected development.
- Projected changes in population.
- Other identified conditions as relevant and appropriate, including the impacts of climate change.

#### Projected Development

Section 3 identifies areas targeted for future growth and development across the County. Any areas of growth located in the special flood hazard area could be potentially impacted by flooding. Areas outside of the special flood hazard can also be impacted by urban flooding and less frequent and more severe flooding events. Specific areas of recent and new development are indicated in tabular form and/or on the hazard maps included in Volume II, Section 9 (Jurisdictional Annexes) of this plan.

#### Projected Changes in Population

Burlington County has experienced an increase in its population since 2010. The New Jersey Department of Labor and Workforce Development produced populations projections by County from 2014 to 2019, 2024, 2029, and 2034. According to these projections, Burlington County is projected to have a population of 460,400 by 2024, 464,900 by 2029, and 472,700 by 2034 (State of New Jersey 2017). Changes in the density of population can impact the number of persons exposed to flooding. As areas continue to be cleared for new development and run-off persists, the population in the County will remain exposed to this hazard. Refer to Section 3 (County Profile), which includes a discussion on population trends for the County.

#### Climate Change

As discussed above, most studies project that the County will see an increase in average annual temperatures and precipitation. Increased severe storm and heavy rainfall events are likely to increase the occurrence and severity of flooding in Burlington County. It is anticipated that the County will continue to experience direct and indirect impacts of flooding events annually that may induce secondary hazards such as infrastructure deterioration or failure, utility failures, power outages, water quality and supply concerns, and transportation delays, accidents, and inconveniences.

## Change of Vulnerability Since 2019 HMP

Burlington County continues to be vulnerable to the flood hazard. However, there are several differences between the exposure estimates of this plan update and the results reported in the 2019 HMP. Updated population statistics and building stock was used in the current risk assessment. Further, exposure for both the population and critical facilities was analyzed. These updated datasets provide a more accurate exposure analysis to the flood hazard.